ALL ARFF AND NO BITE

Executive Development

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ABSTRACT

Information on the provision of Aircraft Rescue Fire Fighting (ARFF) services and the frequency of crashes at index A airports were not available. The purpose of this research project was to determine the composition of non-military ARFF resources, whether the services implied by ARFF were met by those actually provided, and the frequency of crashes at index A airports in the contiguous United States. Historical and descriptive research was employed, (a) to identify the number and affiliation of ARFF personnel at index A airports, (b) to determine the quantity of water and dry chemical on primary ARFF apparatus, (c) to find out how long it takes for additional fire fighting resources to arrive and what is their affiliation, (d) to identify the frequency of crashes with and without fire at Index A airports, and (e) to evaluate whether the expectation of ARFF service is met by actual index A ARFF services.

Procedures involved the review of existing literature and statistics available on aircraft safety, telephone or personal interviews, and the survey of 173 index A airports.

From this research the view of the average index A airport can be presented. In the past year the average index A airport had a 37% chance of at least one crash, and a 3% chance of a crash with fire, involving all types of aircraft served by the airport, normally a general aviation aircraft. Responding to the crash were an average minimum of 1.46 and maximum 2.56 non-military ARFF personnel. The primary responding ARFF unit had an average of 1062 gallons of water and 435 pounds of dry chem. Seven minutes after the initial response off-airport firefighting equipment and personnel arrived.

Research regarding the expectation of ARFF service and the actual service airports indicated that it is not complimentary. Pilots, and possibly the public, look to ARFF to fight fires, gain access to aircraft and rescue those onboard. ARFF, by regulation, exists at Index A airports to arrive at the scene

of an aircraft incident and create a path of escape for the occupants for a period of one minute. Evacuation of the aircraft is the responsibility of the flight crew.

To the FAA and NFPA it was recommended (a) to decide what services ARFF should provide, then staff and equip to that level with consideration to the proximity and capability of the local fire department, (b) that the 1500 gallon, 450 pound dry chem ARFF unit be standard for index A airports, not Rapid Intervention Vehicles (RIV).

TABLE OF CONTENTS

Abstract..... i

Table of Contents.....ii

Introduction.....1

Background and Significance.....2

Literature.....2

Procedures.....23

Assumptions and Limitations.....24

Results.....26

Discussion.....28

Recommendations.....30

Reference List.....31

Appendix A.....34

Appendix B.....51

Appendix C.....59

INTRODUCTION

The City of Lebanon (New Hampshire) Fire Department has provided Aircraft Rescue Firefighting (ARFF) services to the Lebanon Municipal Airport for several years in accordance with Federal Aviation Administration (FAA) guidelines for index A airports. The original FAA approved apparatus, a skid unit with hand lines, was operated by two career structural firefighters. The skid unit was replaced with a new, turret equipped unit that only required one firefighter to operate. The labor union representing the firefighters challenged the reduction in the number of firefighters as an issue of safety through the contractual grievance process. The decision of the arbitrator was in favor of the City. The problem prompting this research was the lack of information regarding the provision of ARFF services at index A airports discovered during the preparation for the arbitration.

The purpose of this research project was to determine the composition of non-military ARFF resources, whether the services implied by ARFF were met by those actually provided, and the frequency of crashes at index A airports in the contiguous United States. Research was undertaken employing historical and descriptive research methodology. Aviation industry literature, Internet sites, FAA databases, interviews, fire service literature and a telephone survey of non military index A airports in the contiguous United States were used to answer the following questions:

1. How many firefighters are available at any time for ARFF response at Index A airports and what is their affiliation?

2. What quantity of water and dry chemical are available on primary ARFF apparatus?

3. How long does it take for additional fire fighting resources to arrive at Index A airports and what is their affiliation?

4. What is the frequency of incidents with and without fire at Index A airports?

5. Is the expectation of service met by actual ARFF services provided at Index A airports?

BACKGROUND AND SIGNIFICANCE

The reduction of firefighters providing ARFF services at the Lebanon Municipal Airport from two to one represented a significant change in the operational practice of the Lebanon Fire Department. The issue was pursued by both management and labor ardently from different directions. For labor, the issue was one of their safety and that of the passenger. For management, the issue was of regulation, intent, risk and cost. Both proceeded to arbitration with few facts, established perceptions and purpose of conviction.

This research investigates the safety record of the aviation industry in general and certified index A airports in particular. It documents current industry practice for the provision of ARFF services and the challenges that ARFF faces. It investigates the frequency of on airport incidents at certificated index A airports.

This research addresses the issue of organizational change and development, a unit of instruction in the Executive Development course at the National Fire Academy. Members of the Aviation Industry and Fire Service of the United States who are tasked with the provision or administration of ARFF services will find this research useful.

LITERATURE REVIEW

The literature review for this project involved research in five distinct areas. Available data bases were accessed for available statistical data on aviation industry safety, specific aircraft safety records and airport listings. Public, private and governmental sector literature was searched for information relative to the human resource and equipment of index A airports. Safety organization

reports and telephone interviews were utilized to obtain first hand information of actual on-airport crashes. Aviation and fire service literature provided an insight to the issue of funding ARFF. Aviation resources were utilized to obtain different points of view regarding the viability of ARFF.

Aviation Safety

Noting trends in commuter airline fatality statistics, Mr. Ed Sussman (1988) wrote in the Washington Monthly: "Between 1970 and 1978 more than 13 people died for every one million passengers who boarded the smallest two-thirds of the commuter airlines." Further in the same article, referencing conditions in 1988, Mr. Sussman noted: "For every one million passengers who board one of these small airlines, slightly more than four will die" (Sussman, November 1988 p32).

A review of the National Transportation Safety Board (NTSB) (1997)departure statistics for commuter air carriers from 1982 to1996 showed that the number of scheduled Commuter Air Carrier departures had increased from 2,026,691 to 3,171,000 an increase of 56.4%. During this same period of time the fatalities per 100,000 departures exceeded the 1982 rate of .247 for five years with a high of .356 fatalities. Fatalities dropped below the 1982 rate for ten years including six years with a rate of less than .1 fatalities. (Aviation Safety Table 5)

Looking at safety from the statistical perspective of the airport, the NTSB (1997) report Commuter Air Carriers, Fatal Accidents, Fatalities 1993 shows that four fatal incidents occurred involving commuter Air Carriers. These four fatal incidents resulted in the deaths of 24 persons. Of those four incidents, one occurred on the airport. The one on airport incident was not a crash but in fact an accident involving a ground crew member who was struck by a propeller.(NTSB Table 9.7 1997 July 1)

The Avweb Group (1995) in comparing accident statistics from 1993 to 1994 the National Transportation Safety Board (NTSB) reported that for scheduled commuter airlines, fatal accidents per 100,000 departures fell to .097 from .125 during 1993 (Avweb, 1995 August 1). This statement was further enhanced when Landings (1997), an Internet web site providing aviation news and product information wrote, "There were fewer general aviation accidents in 1996 than in any year since record-keeping began in 1938." (Landings, 1997 March 7). Continuing the positive trend, the 1996 safety report was even better than 1994. NTSB (1996) reported that of 8,185,000 scheduled commuter airline departures in 1996, there were 11 incidents. Of the 11 incidents, one resulted in 12 fatalities or .037 fatalities per 100,000 miles. Of the 369,000 non-scheduled commuter airline departures made in 1994, there were 87 incidents. Of the 87 incidents, 27 resulted in 59 fatalities or .006 fatalities per 100,000 departures (NTSB U.S. Aviation Table 1, 1996).

From the Federal Aviation Administration (FAA) Administrators Fact Book (1997) came a comparison between planes and fatalities. There were 18,270 United States registered aircraft engaged in airline passenger service in 1995. During that year 237 people lost their lives. Of that 18,270 there were 12,891 commuter air carriers and air taxi aircraft which accounted for 61 of the 237 fatalities. A total of 548 million passengers flew aboard U.S. aircraft over 5,293 million miles. During that same period an additional 181,300 General Aviation (GA) aircraft flew 25.4 million hours during which another 732 fatalities occurred (FAA Administrators Fact Book - Safety, Table 10, 1997 July 1).

As examples of individual commuter aircraft safety, an Internet search for data on the SAAB 340 and Beechcraft 1900 aircraft led to the Aviation Safety Web Home Page (1997). In production since 1958 the SAAB 340 was reported involved in eight incidents world wide, only one of which was

a United States registered aircraft. Of forty-three Beechcraft 1900 incidents documented since 1969 world wide, 29 were United Stated registered aircraft. (Aviation Safety, 8/24/97)

Looking for safety data on a commuter airline serving Lebanon, the Air Safety Committee Internet site (1997) was found. Using such resources as Flight International magazine, the New York Times, ICAO and the NTSB, In Fatal events since 1970 for US Airways (formerly USAIR), US Airways has been involved in eight fatal incidents since 1970. Of those eight, three were commuter aircraft. Of the three commuter incidents one occurred on the airport resulting in the death of two of the 25 persons aboard. (Air Safety Committee, March 1997)

Considering commuter safety as a component of overall transportation fatalities, the NTSB (1995) reported in Comparison of U.S. Transportation Fatalities -Year 1994 vs. Year 1995 that during the two year period, a total of 87,780 people died in transportation incidents of all types. Total aviation fatalities during this two year period accounted for 2040 fatalities or 2.3% of the total. Of the 2040 aviation fatalities, general aviation incidents claimed 1455 lives. Foreign registered aircraft and United States major airline incidents accounted for another 436 lives lost. The remaining 149 fatalities, 7.3% of the total aviation related fatalities or 0.16% of the two year total transportation fatalities were attributable to commuter aircraft. (NTSB Source 382-8013, 1995 December 31)

Reviewing these statistics, the picture of a very safe mode of transportation emerges, one that is continuing to improve. As an example, utilizing the four fatalities to one million passenger example of Mr. Sussman (1988), Lebanon Airport will statistically incur four fatalities every 20 years at current passenger departure levels. The unanswered question is how many will occur on the airport proper?

Looking to the aviation insurance industry for insight, I interviewed Leroy H. Wilcox on October 15, 1997 at his Dummerston, Vermont home. Mr. Wilcox is Senior Advisor for AON Risk

Services, one of the largest aviation brokerage companies in the world. AON insures airports that vary in size from Nantucket Memorial to Boston Logan, and airlines such as United and Northwest. I asked Mr. Wilcox for any insight he could provide on aircraft safety from the insurance industry standpoint. Mr. Wilcox stated that in general about 80% of crashes occur during landing or taking off. At issue is the fact that if an aircraft is not at cruising altitude, it is either landing or taking off. "When they (aircraft) are at cruising altitude for the most part, they can handle most situations" (L.H. Wilcox, personal interview, October 15, 1997).

When asked what the risk is to aviation insurance as compared to other insured risks, Mr. Wilcox advised that aviation insurance is less scientific and more reliant upon intuition and history. He used as an example the Boeing 747. When first placed in service in 1969, the industry expected the loss of two 747's within the first 18 months of operation at a loss of 20 million dollars each. The first Boeing 747 loss actually occurred 9 years later over Africa. It was not a United States registered 747 (L.H. Wilcox, personal interview, October 15, 1997).

When asked about his views on loss, Mr. Wilcox stated that he believes that loss runs in cycles. He used PanAm as an example. PanAM suffered five losses in one year and then nothing for several years. He then said "On the other hand, another international carrier started operations in 1946 and suffered its first loss in 1992 in Columbia, South America". He concluded that "every ten years or so all hell breaks loose" (L.H. Wilcox, personal interview, October 15, 1997).

Asked if insurance recognizes or discounts for service out of airports with ARFF coverage, he stated that the availability of ARFF is not an influence in rates for any type aircraft, including general aviation. He commented that while there is a correlation between loss and the number of take-offs and landings made, ARFF was not a factored consideration. The greater the number of take-offs and

landings, the greater the risk of an incident occurring (L.H. Wilcox, personal interview, October 15, 1997).

Asked if aviation insurance companies get involved with risk management, he stated emphatically yes. He gave an example of a helicopter company in Columbia whose insurance rates were at 17% of the "burning cost factor" (an industry term for break even on an insurance settlement) due to their safety record. Risk management found that the pilots were overworked. Pilots were making multiple, demanding flights on a daily basis. Risk management inspired breaks, and limiting pilot flying hours resulted in the reduction of incidents. Insurance costs were reduced over the next 2 years to a more reasonable 6% (L.H. Wilcox, personal interview, October 15, 1997).

ARFF Unit and Manning

While the number of firefighters needed for ARFF is not specified by Title 14 CFR Part 139 (the governing policy concerning firefighting at civil airports), the performance of the unit is. On the human resource issue,14 CFR Part 139 states: "Sufficient rescue and firefighting personnel are available during all air carrier operations to operate the vehicles, meet the response times, and meet the minimum agent discharge rates required by this part" (Title 14 CFR, Part 139.319).

The Fire Chief's Handbook provides the same information in a more traditional fire service litany: "The FAA requires enough on-duty personnel to get the required number of vehicles to an aircraft incident scene and discharge the required flow of extinguishing agent. This can usually be accomplished with one driver operating the top turret nozzle." (Bachtler and Brennan, 1995 p773).

The National Fire Protection Association (NFPA) Standard 403, Aircraft Rescue and Fire Fighting Services at Airports states; "During flight operations, sufficient trained personnel shall be readily available to staff the rescue and firefighting vehicles and to perform firefighting and rescue operations"

(NFPA 403, Chapter 6). Another NFPA Standard also addresses the issue of human resources. NFPA 1500, Standard on Fire Department Occupational Safety and Health Program requires; "The fire department shall provide an adequate number of personnel to safely conduct emergency scene operations. Operations shall be limited to those that can be safely performed by the personnel available at the scene" (NFPA 1500, Chapter 6, Section 4.1). Amplifying the statement of adequate numbers comes from the NFPA 1500 Handbook (an interpretive publication): "NFPA 1500 clearly states that operations must be limited to those functions that can be performed safely by the personnel on the scene. The responsibility is, therefore, established in the direction of limiting actions based on the number of firefighters present" (Teele, 1992, p345).

The aviation industry provided insights to ARFF from different views. One view of ARFF comes from the perspective of the airports. A position letter to the FAA commenting on a FAA Report to Congress entitled Aircraft Rescue and Firefighting Services - Mission Response Study was found on the Internet site for the American Association of Airport Executives (AAAE). The FAA study compared civil airport ARFF capabilities to military air bases. Director M. Theresa Couta and Senior Vice President Richard Marchi (1996) of AAAE wrote "Although the majority of civilian airports may depend on some kind of community help for providing ARFF services, a large portion of them are clearly self-sufficient." (Couta; Marchi 1996). This declaration of self sufficiency continued with; "According to the Rural Metro Data, in the majority of cases, protection against structural fires at civilian airports is provided by the same provider of other ARFF services." (Couta; Marchi 1996). The evaluation of fire fighting capabilities was addressed by noting:

> Your notice implies that ARFF services at civilian airports do not have the ability to extinguish fires completely since they are only required to be able to provide an escape path from a

> burning airplane. In fact, most of our member airports far exceed the minimum requirements of Part 139 to provide an escape path and can easily fight fires to complete extinguishment (Couta; Marchi 1996).

The AAAE presents a positive view of existing conditions.

The view of airline pilots may be somewhat different as obtained via an Internet search. Captain Robert Perkins (1997), a member of the Airline Pilots Association International (ALPA) Airport Standards Group maintains a home page called The Airline Fire Page. "At some airports, they have a staffing requirement calling for a minimum of one firefighter and one fire fighting vehicle"(Perkins, 1997 June 15). He goes further on to pose a scenario involving a one firefighter, one vehicle response:

> How about if it is just unable to reach you and becomes stuck in mud, snow or sand. Aircraft accidents do not happen on runways all the time. But this time, we are lucky. Our one truck has managed to respond quickly (within the required three minutes) and help is at hand. Or is it? Under the present regulations, the mandate of firefighters is not to rescue you, but to provide you with an escape path, free from fire, from the aircraft. How you get out of the aircraft is up to you and your flight crew. The firefighters are not required to attempt to fight a fire internal to the aircraft passenger cabin (Perkins, 1997 June 15).

The airline pilots seem to take a position of not enough equipment, not enough fire fighters.

The reference to the Rural / Metro Data (Couta; Marchi 1996) prompted further investigation culminating in the acquisition of the Rura l/ Metro Corporation 1995 ARFF Survey. This survey which in part covered 237 Index A airports, was prepared based upon responses from 60 of a reported 237 airports or 25.3% (Rural / Metro, 1995 p1). The low response to the Rural Metro Survey about Index A issues prompted a survey of Index A airports as a component of this project. According to the

Rural Metro Survey, “In some cases both the on-site ARFF response and any supplemental response are provided by the city fire department.” (Rural / Metro, 1995 p6). The Summary identified that the “Average number of personnel assigned to an Index A Airport is 9" (Rural / Metro, 1995 p6). Interpreting the data indicates that the average department responding to the survey was apparently made up of a chief and eight ARFF trained personnel. As to how many fire fighters are on ARFF units the survey was vague: “Some airports operate with only one person assigned per vehicle and do not base their staffing on need criteria and air traffic levels” (Rural / Metro, 1995 p8).

The next task was to look at the issue from the perspective of the ARFF unit. “In about 1950, the Port of New York Authority started development of a crash rescue vehicle, beginning with little more than a municipal type fire truck with the addition of foam capabilities” (Raeder, 1992).

I interviewed Mr. Phillip Raeder, Director of Marketing for the Walter Truck Division of KME, at Lebanon, New Hampshire on November 20, 1997. We talked about Rapid Intervention Vehicles (RIV). The RIV is also called a quick response unit, not unlike the mini-pumper concept of the 1970's. Mr. Raeder advised that the term RIV is highly misleading as most of them are slower than the larger 1500 gallon units. “Our 1500 gallon units are ten seconds faster in a quarter mile than an RIV,” he said. Price wise, an RIV with 300 to 500 gallons of water can cost between 175 and 200,000 dollars while a 1500 gallon unit costs about 300,000 dollars. The difference must not only be measured in cost, but evaluated against needed fire power, off pavement movement and operational time. An RIV discharges about 150 - 250 gallons per minute (GPM) for about one and a half to two minutes and must do so at a rather close range. A 1500 gallon unit with multiple turrets can discharge from about 350 GPM up to 750GPM, more than twice the volume, almost triple the duration and at greater range (P.K. Raeder, personal interview, Novemeber 20, 1997).

Some airports have FAA funded RIV's as the primary and only on airport based ARFF unit. The International Fire Service Training Association (IFSTA), (1992) mentions the RIV and advises:

> It is critically important that this vehicle be capable of being operated by just one person, if necessary, and that this person can place the extinguishing equipment in action. One person, however, is not considered an adequate rescue force. The RIV is not considered a rescue vehicle but rather a vehicle used for the initial attack of an aircraft fire (IFSTA, 1992 p41).

IFSTA (1992) addresses this shortcoming by a resource management statement; "If the nature and/or scope of the incident is clearly beyond the capabilities of the first arriving unit, the most productive action may be to switch from attacking the incident to managing it." (IFSTA, 1992 p128)

These two statements are quintessential to Index A ARFF equipment and manning. If an airport has only an RIV or a unit operated by one firefighter, rescue is not an option within the

scope of the unit and fire fighter.

Another view of the RIV emerges as NFPA presents its view of capability of the RIV: The RIV brings to the crash scene the quantity and discharge capacity of extinguishing agent necessary to (1) extinguish an incipient stage fire, (2) hold a fire from enlarging until larger crash vehicles arrive, or (3) maintain at least one fire free, clear escape path for the rescue of passengers and crew. (NFPA 403, Annex A)

In establishing how much extinguishing agent should be carried, a rectangular area called the Practical Critical Area (PCA) is used. Determined by an NFPA specified calculation, a PCA can be established for each type of aircraft. The amount of extinguishing agent is then determined from the amount of agent necessary to maintain coverage of the PCA for one minute (NFPA 403, Section A-2-3.1). The decision for establishing the one minute time requirement was based upon: "Information from reliable large-scale fire tests, empirical data from a wide variety of sources, and field experience worldwide indicates that 1 minute is both a reasonable and a necessary operational objective" (NFPA 403).

As an example, the SAAB 340 has a PCA of about 4471 square feet (NFPA 403). In order to secure a spill fire of 4471 square feet with 3M brand Light Water, a minimum application rate of 179 gallons of finished foam per minute must be delivered. The calculation is based upon an application of .04 gallons per square foot, which is an absolute minimum (3M, 1981). If a multi-purpose class A-B foam such as BioSolve is used at its optimum application rate of .2 gallons per square foot, an application rate of 894 gallons per minute would be needed. (Westford Chimical Corp. 1995). While the PCA is a theoretical area, meeting some of the flow rates and capacities may be a challenge for some of the smaller RIVs and skid units.

Addressing the issue of extinguishing agent the Rural / Metro Survey (1995) reported that 231 gallons of AFFF concentrate and 1491 gallons of water were reported on hand at the average index A airport (Rural / Metro, 1995).

The quantity of water available according to the Rural Metro seemed high, especially since:

> Many respondents cited the amount of extinguishing agent required by the FAA for index A airports as not enough agent to adequately fight most aircraft fires. Most have asked for larger apparatus with increased extinguishing agent capacities, but are restricted by budget constraints" (Rural / Metro, 1995).

Summing up the conditions at one airport in the September, 1997 Internet issue of the Victoria Business Magazine, Victoria (Texas) Regional Airport Manager Pat Rhodes (1997), wrote about the ARFF unit at her Airport.

> Our truck complies with regulations in that it carries 100 gallons of AFFF and 450 pounds of dry chemical. The final criteria is that the truck must be able to leave its station on the airport, respond to the mid-point of our longest runway, and begin to discharge agent in less than 3 minutes (Rhodes, 1997, September).

On Airport Crash Incidents

In searching for an experienced perspective regarding on airport crashes, insight on two fatal crashes was obtained. According to Deputy Chief Rick Zaerr (1997) of the Quincy Fire Department, on November 19, 1996 a runway collision occurred at the Quincy Municipal Baldwin Field in Illinois involving a Beechcraft 1900C Commuter and an Air Taxi. The Beechcraft succumbed to a spill fire and all aboard died. The airport holds a limited certification, receiving over 30 passenger aircraft on an

unscheduled and infrequent basis. ARFF coverage is only present when over 30 passenger aircraft arrive and depart (R. Zaerr telephone interview, November 6, 1997).

The NTSB (1997) aircraft accident report Runway Collision dated July 1, 1997, was obtained in part from the Human Survival Factors Division of the FAA. According to the report, the Quincy Fire Department attacked the fire with 2 engines, the ARFF 500 gallon unit and additional mutual aid units. The fire was under control 10 minutes after the Fire Department arrived (NTSB ARR-97/04, 1997 July 1). The report continued: "According to the Fire Chief, the Quincy Fire Department and the City of Quincy began to investigate ways to staff the ARFF truck at the airport during periods beyond that required by the FAA" (NTSB ARR-97/04, 1997 July 1). The stimulation for this action may have been prompted by the following by the supposition contained in the report:

> Witnesses observed that the fire was burning on the right side of the Beech 1900C, about 1800 feet from the airport's ARFF truck. If properly staffed, that truck should have been able to reach the accident site in no more than one minute. Fire Fighters might then have been able to extinguish or control the fire, thereby extending the survival time for at least some of the occupants of the Beech 1900C. Those occupants might then have had time to escape through the over wing exit hatch. Accordingly, the Safety Board concludes that if on airport ARFF protection had been required for this operation at Quincy Airport, lives might have been saved (NTSB ARR-97/04, 1997 July 1).

According to Deputy Chief Zaerr (1997), this was Quincy's first on airport crash in more than 20 years. Their ARFF unit is an older 500 gallon, 350 pound dry chem unit with a turret. It is manned during over 30 passenger seat flights with ARFF trained structural firefighters from the nearest station. The airport lies about eight miles outside the City. Within the City, the Fire Department delivers an

average 2-3 minute response time through the use of a decentralized response force. According to the Deputy both he and his firefighters feel they could have made a difference had they been on scene. Detailed to the airport for these infrequent assignments, the firefighters are normally in their protective equipment, with the ARFF unit ready to respond (R. Zaerr, telephone interview, November 6, 1997).

As a follow up to the one minute response time mentioned in the NTSB report, tests were conducted at Lebanon Municipal Airport using a 300 gallon / 500 dry chemical Walters RIV. It took between 34 and 37 seconds to cover the 1800 feet from a standing still position with the engine running. Earlier tests had established an average time of 96 seconds to respond to the unit from close by, don protective equipment, start the unit and pull it clear of the station. An estimated total response time would be about 100 seconds under best conditions.

I was able to speak with Mr. Larry Roman of the NTSB by phone on November 7, 1997. Mr. Roman (1997) was on-site at Quincy, Illinois for the crash investigation of the Beechcraft 1900C and wrote the initial report. Asked about the estimated time frame of one minute response used for the ARFF unit, Mr. Roman advised that the one minute represented a best case situation which "you use when you are trying to sell a product"! Mr. Roman expressed a strong belief that intervention could have made a difference with the unit manned. In questioning his views on the manning levels for ARFF, Mr. Roman said that while he has not seen any extinguishment of interior aircraft fires that could have had impact upon occupant survivability, he questions the validity of manning to fight exterior fires only and not interior fires. He also questions the practice of relying upon the evacuation of an aircraft to be accomplished by the flight crew and / or self evacuation alone. In closing, Mr. Roman noted that in 1984 the NTSB recommended that all ARFF vehicles be manned by a minimum of two firefighters. The FAA did not concur with this recommendation (L. Roman, telephone interview, November 7, 1997).

The second incident involved the crash and fire of an air taxi at the Igor Sikorsky Memorial Airport in Connecticut. The information came in response to a request for information from the Regional Coordinators of the Aircraft Rescue and Fire Fighting Working Group (ARFFWG).

On November 14, 1997 I had a phone conversation with Kurt Sendlein (1997). Mr. Sendlein is a member of the ARFFWG and an ARFF fire fighter. On April 27, 1994 Mr. Sendlein was on ARFF duty and responded to an Air Taxi that had crashed into a blast fence with resulting fire. Mr. Sendlein responded by himself aboard a 1500 gallon / 500 pound dry chemical ARFF unit. Mr. Sendlein said that he had almost expended all of his extinguishing agent trying to extinguish the fire he faced. Just as he was running out, additional help began to arrive. In his view an ARFF unit with less than 1500 gallons of water is useless. He strongly believes that 1500 gallons should be the minimum unit available for ARFF. To the issue of rescue, Mr. Sendlein related that during his effort to extinguish the fire, he had inadvertently hit and blown the lone survivor clear of the engulfing fire with his turret delivered foam stream. It was not until later that Mr. Sendlein became aware of this. "By myself", he said, "driving the unit and fighting the fire was all I could do". Asked if in retrospect anything could have been done, Mr. Sendlein replied that the NTSB team, after reviewing the incident, had told him that in order for his unit to have had a greater impact on the outcome, the unit would have been hit by the plane (K. Sendlein, telephone interview, November 19, 1997).

Funding

I interviewed Mr. Dave Lotter, Vice President Technical Services, Regional Airline Association, Washington DC by phone on November 12, 1997. Mr. Lotter (1997) was very positive in both his and the organization's support for ARFF. The issue, according to Mr. Lotter, is the cost and how to

pay for it without compromising the economics of the commuter airport (D. Lotter, telephone interview, November 12, 1997).

The Rural Metro Survey (1995) reported a similar point, that "overall, the issue of budget and payroll is of paramount importance to today's operation of ARFF services for airports" (Rural Metro 1995). The reason for this according to the report is that "the airport cannot afford to have dedicated ARFF personnel standing-by at the ARFF station" (Rural Metro 1995). Identifying some current cost saving measures, the report noted that "Many airports, especially the smaller ones, utilize ARFF staff for other duties such as security, maintenance, operations and even custodial services to increase productivity" (Rural Metro 1995). "Another measure that impacts favorably on funding is the wider spread use of remote control turrets on ARFF units which allow one fire fighter to operate the unit" (Rural Metro 1995).

Discussing various options for the provision of ARFF coverage in the article Outsourcing ARFF, Mr. Eric Liang II (1996) referenced outsourcing ARFF to private contractors including Fixed Base Operators (FBO) and Airlines. "Bryant, now the airport manager for the Salisbury-Wicomico (MD) Regional Airport, contracts with Piedmont Airlines for ARFF services. Sixteen of Piedmont's mechanics provide the services for the 14 daily departures" (Liang II, 1996). Mr. Laing ended his article by stating " The bottom line is that it doesn't matter who is pointing the hose at the flames as long as they have proper training, and can get to the fire scene in the required time"(LiangII, 1996).

Mr. Robert Bryant, Manager of the Salisbury-Wicomico (MD) Regional Airport was interviewed by telephone on November 14, 1997, and asked how the airline based ARFF was doing. Mr. Bryant (1997) advised that his airport was the hub for Piedmont Airlines and that the arrangement was a perfect match. He further advised that morale was high in that they were receiving top notch

training from State of Maryland Fire Service Instructors. When asked to rate his personnel, he said "I have 100% faith in their ability to provide excellent first responder ARFF services sufficient until the arrival of nearby structural fire departments" (R. Bryant, telephone interview, November 14, 1997).

What will the City of Quincy be doing as a result of the November 16, 1996 crash? At the end of our November 6, 1997 phone conversation, Quincy Deputy Fire Chief Zaerr (1997) philosophized that hopefully "Bad is stimulating good", but money is needed. The City of Quincy is exploring the possibility of developing an industrial park out by the airport. Both the airport and the industrial park would be complimented well with the provision of fire fighting protection. Without this park however, Deputy Zaerr is not optimistic. The City believes that with the frequency of incidents, continuous manning is not justified unless funding is available (R. Zaerr, telephone interview, November 6, 1997).

Looking toward the future, Victoria Regional Airport Manager Pat Rhodes (1997) wrote about her future manning options:

> When the requirement for full-time ARFF coverage at the airport becomes a reality, the best option seems to be for the airport to hire its own firefighters and use the city fire department as a back-up in the event of a major incident. Other airports our size staff their ARFF operations with certified firefighters from departments in their vicinity (Rhodes, 1997, September).

The Proponents and Opponents of ARFF

In his article A Case Against ARFF the late F. Russell Hoyt, a long time opponent to the cost of ARFF presented the issue of ARFF from two perspectives; ARFF justification and ARFF effectiveness in crash rescue operations. From the point of ARFF justification, Mr. Hoyt (1994) referenced a November, 1987 report by the General Accounting Office (GAO) which he documented as RCED-88-41 Airport Certification Program to Congress. The GAO recommended allowing the use of alternatives

to CFR (the previous name for ARFF). Contrary to this recommendation, then DOT Secretary Pena approved a proposal for the expansion of ARFF at all commuter airports because of the safety benefits from having crash, fire and rescue. Mr. Hoyt noted that Secretary Pena "completely ignores the General Accounting Office recommendations and gave no specifics of the safety benefits" (Hoyt, 1994, March).

Regarding effectiveness of ARFF, Mr Hoyt wrote:

> There is little argument that life cannot be sustained in excess of 90 seconds in a serious accident involving fire. Unless aircraft occupants escape on their own or are assisted by other passengers or crew, they will not survive. Current Part 139 requires a crash/fire/rescue response time of 180 seconds to the midway point of the most remote air carrier runway (Hoyt, 1994).

He was quick to point out however that "the few serious accidents that do occur on or near airports do not conveniently occur at the midpoint or less distance of the runway, nor are they accessible on paved surfaces" (Hoyt 1994). Mr. Hoyt ended with "There is no experience-gained basis for the assumption that ARFF services at commuter airports will improve aircraft occupant survivability" (Hoyt, 1994).

A letter to the editor of Airport Business rebutting Mr. Hoyt's, A Case Against ARFF, was acquired from Mr. Pierre Huggins, Staff Engineer for the Airline Pilots Association International (ALPA). The letter was written by Mr. Thomas J. Phillips, Chairman of ALPA Accident Survival Technical Committee. In it Mr. Phillips (1994) responded that: "ARFF is effective and necessary. ARFF for commuter airports is needed, though it may indeed need some customizing for the particular operations" (Phillips, May 1994). He went on further that, "Review of accident data shows that the survivable accidents that we are concerned about, where we seek to enable survival of those aircraft

occupants that survive the initial accident impact, are in the vast majority occurring on the airport" (Phillips, May 1994). Continuing on he wrote that: "more than 50% of the fatalities in survivable accidents are the result of smoke and fire. It is for this reason that rescue and fire assistance is so critically needed" (Phillips, May 1994). Mr. Phillips defined his vision of airport safety as follows: "first, to make sure the airport has an emergency plan that is integrated into the community. Second, they need to designate a person to perform the task of airport rescue and fire fighting. The person assigned that task does need some special instruction in first aid and rescue" (Phillips, May 1994). The last point by Mr. Phillips was "there needs to be equipment that will be able to respond swiftly to the accident site"(Phillips, May 1994). In his conclusion, Mr. Phillips concurred with Mr. Hoyt that airports should plan emergency response for "the real point of accident locations" (Phillips, May 1994) and that terrain access limitations are a real issue". His solution however was not to do away with ARFF but to "stabilize the terrain" and minimize grade changes. While Mr. Phillips suggestion would make ARFF response more effective, it is not a simple solution in light of today's environmental consciousness and the focus on the protection of wetlands.

On November 20, 1997 Mr. Phillips was interviewed by telephone to follow up on his letter of rebuttal to Mr. Hoyt.

The interview started by suggesting to Mr. Phillips that in many respects it appeared that he was in agreement with Mr. Hoyt. Mr. Phillips (1997) stated that in reviewing Mr Hoyt's points regarding ARFF, he did agree with Mr. Hoyt from a dollar and cent point of view. Mr. Phillips in turn questioned me. Philadelphia International Airport, an Index D, has not had a major incident since 1954. "Does that mean that we should do away with ARFF at this airport?" He went on to say that ARFF ideally represents a standby force waiting to assist in time of need. ARFF he said, "is not a dollar and cents

issue, it is a moral issue". When an airport is placed in operation, the public has a perception of safety. This perception demands, according to Mr. Phillips, that "Someone, somewhere must be responsible for the level of safety maintained". He further went posing two questions; "Does the passenger deserve a high level of safety and is the airport responsible for providing it?" Mr. Phillips believes that the Quincy, Illinois crash may directly impact upon answering those questions. Mr. Phillips was part of the representation sent to the Quincy crash site by the Airline Pilots Association. He referred to the incident as "a potential litigation case of great interest to follow in the future". "At present", he said, "the responsibility for what level of safety is maintained comes under the requirements of the Federal Aviation Administration, delivered on a unilateral basis" (T. J. Phillips, telephone interview, November 20, 1997).

I asked him his opinion regarding the title and implication of Aircraft Rescue Fire Fighting when it seems that ARFF is manned for exterior fires only. Mr. Phillips (1997) replied that he feels uncomfortable with the current arrangement especially since none of the off-airport response personnel are required to have any airport or aircraft training. According to Mr. Phillips, a suggestion was made to the FAA to increase the frequency of airport disaster drills from every three years to every two years as a method of dealing with off airport resource training. To date, no change in the frequency of the drills has occurred. In closing, Mr Phillips again posed a question: "When certificate requirements were established for aircraft with 30 or more seats, how was the number 30 arrived at" (T. J. Phillips, telephone interview, November 20, 1997)? I could not find an answer to that question.

Perceptions

While conducting the literature review I found that views regarding ARFF were strong and diverse. The singular point shared by all appeared to be emotion. This was first noted while trying to

contact Mr. Phillips through Mr. Pierre Huggins, Staff Engineer with ALPA. Mr. Huggins was quite taken back when I mentioned this study and crash statistics. Mr. Huggins felt that I was taking the "airport view". In discussing this with him, it became apparent that there was a psychological perspective to the ARFF issue that had not been considered. Pilots, in seeing firefighting equipment take comfort in knowing that they are not alone, that there are others who will look out for the well being of people on an aircraft. Whether the flying public shares this view might well be the subject of a later study (P Huggins, telephone conversation, October 30, 1997).

An aviation industry reference on public perception was found. Speaking about passenger preference for jets, Atlantic Coast Airlines Chief Jerry Skeen (1997) was quoted as saying:

> We're dealing with perceptions, and ever since the events of two years ago (American Eagle ATR 72 crash near Roselawn, IN) and the extreme media attention and scrutiny our industry received, I think there are passengers out there who believe there is a difference in safety between the two. We know that, statistically, it is not the truth, but perception drives people's decisions. (Anderson, 1997 p63)

Perception may indeed be a driving force to be considered in the provision of ARFF services. In talking with pilots at the Lebanon Municipal Airport as well as my colleagues, in developing this research, it became apparent that the statistical component of aircraft safety may be secondary to the perception and paradigms of the general public. While it may be safer to fly than drive, people accept and live with the day to day issues of automobile safety and the fatalities it brings. The public does not accept aircraft crashes in that they are out of the ordinary, spectacular and memorable.

PROCEDURES

The desired research was to determine the composition of ARFF resources, determine whether the services implied by the name ARFF were met by the services actually provided and the frequency of incidents at index A airports in the contiguous United States. Historical research was utilized to review existing literature and statistics available on aircraft safety and ARFF. Interviews in person or by phone were conducted with key aviation industry personnel and those with first hand experience with on airport crashes. Descriptive research was employed to establish the current conditions surrounding the provision of ARFF services and the frequency of crashes at Index A airports. To accomplish this, a telephone survey of certified commuter airports in the contiguous United States was conducted

As part of the descriptive research, three databases were created. Appendix A was created from a list entitled Airport Certification under FAR 139 - By Region and the data acquired as part of the telephone survey of index A airports. The survey instrument utilized for the phone survey and the tabulated results are contained in Appendix B. Selection of the survey sample was determined based upon the ability to contact. Two Internet sites, the FAA Certified Airports (**www.faa.gov/arp/139arpts.htm)**and AIRNAV Airport Information (**www.airnav.com/airports/**) where utilized to develop a telephone list of index A airports. Those airports that could be contacted by phone within four attempts were included. The survey instrument was designed to provide the current status of resources available for ARFF response and a frequency of aircraft incidents from the on-airport perspective. Appendix C is a listing of commuter and air taxi crashes at index A airports from 1991 through 1996. It was created from individual commuter and air taxi incident reports obtained from Ms. Carol Floyd, Human Survival Factors NTSB. The purpose of this database is to identify how many commuter and air taxi incidents occurred at Index A airports, what was the cause, how many were injured and what operation the aircraft were doing at the time of the incident.

The compilation of data and literature was analyzed and used as a basis to formulate answers and recommendations as outlined in the respective section of this document.

Assumumptions - Only knowledgeable individuals, experienced in their chosen field authored the written materials that were used in the research. Those who were interviewed and/or authored written materials were honest in their research and opinions. Statistics obtained from various government agencies and industry sources are correct and representative of the raw data originally obtained. All ARFF units with water carry at least sufficient fire fighting class B foam to create foam streams equal to the amount of water carried.

Limitations - The research materials and literature analyzed were limited to those obtainable by Internet access and library research. The survey of index A airports was limited to non-military airports in the United States, excluding Alaska, Hawaii, United States possessions and territories. These exclusions were purposefully done to concentrate on conditions at non-military owned, index A airports in the Continental United States excluding Alaska.

Definitions

14 CFR - Another abbreviation for Title 14, Code of Federal Regulations. This Title contains Part 139, commonly known as the Federal Aviation Regulations.

Air Taxi - Scheduled and non-scheduled commuter aircraft for hire.

ARFF - Acronym for Aircraft Rescue Fire Fighting. Previously known as CFR.

CFR - Acronym for Crash Rescue Fire Fighting. Replaced by ARFF.

Commuter- An aircraft or airport that feeds to a larger airport for further transportation or provides transportation regionally.

FAR - Acronym for Federal Aviation Regulations, Part 139 14 CFR.

FBO - Acronym for the Fixed Base Operator. This is a company that provides the fueling, hangar and support services to aircraft at the airport.

General Aviation - Privately owned aircraft, generally smaller

ICAO - Acronym for the International Civil Aviation Organization, an international standards organization for safe and orderly international transportation services

Index A Airport - A certified airport that receives over 30 passenger seat aircraft of less than 90 feet in length on a frequent basis.

Part 139 - Certification and operations: Land Airports Serving Certain Air Carriers. Another common term for Title 14 CFR Part 139.

Skid Unit - A self contained combination foam and dry chemical unit using hand lines to deliver extinguishing agent that is mounted on a pick up truck type chassis.

RESULTS

The following answers were developed as a result of this research:

Research Question 1 -The average index A airport has a minimum of 1.46 and a maximum of 2.56 non-military ARFF personnel available for response at any time. The affiliation of the personnel providing ARFF is as follows:

Number of Airports	Affiliation of Personnel Providing ARFF Coverage
1	Career firefighter with an airport operations person
1	Combination career / volunteer department provides fire fighters
1	Utilizes Port Authority personnel
1	Utilizes the State Forestry personnel
9	Airport ARFF Department with dedicated staff.

16	Airport Public Safety Department providing police, fire, EMS services
3	Contracted ARFF coverage to other than municipal fire departments
3	Volunteer firefighters, paid for ARFF duty
40	Career fire fighters
66	Airport operations / maintenance personnel
9	Utilize on airport military ARFF resources
150	TOTAL

The individual survey responses are contained in Appendix A, Table 2. The tabulated survey results are found in Appendix B, Tables 1 and 2.

Research Question 2 - The average primary ARFF unit has 1062 gallons of water and 435 pounds of dry chemical extinguishing agent. While an average of 1000 gallons of water is reasonable, consider that 40 units (35%) have less than 1000 gallons per unit while five units (3.5%) averaging 2,480 gallons per unit carry (8.2%) of the total water.

The individual survey responses are contained in Appendix A, Table 2. The tabulated survey results are found in Appendix B, Table 3.

Research Question 3 - Additional fire fighting resources arrive at the average index A 6.96 minutes after being called. Representing quick response, 22 airports (15%) receive outside help in three minutes or less. At the other end of the spectrum, 18 airports (13%) wait more than ten minutes for help to arrive.

Career fire departments provide assistance to 82 airports (57%). Combination fire departments provide assistance to 19 airports (13%). Volunteer fire departments provide assistance to 39 airports (27%). Boeing industries provides immediate help at 2 airports while a nearby military airbase provides help to another.

The individual survey responses are contained in Appendix A, Table 2. The tabulated survey results are found in Appendix B, Table 4.

Research Question 4 - The last unannounced crash for 53 airports (35%) was less than one year ago. The last time a crash occurred for 27 airports (18%) was between one and two years ago. Another 21 airports (21%) recalled a crash between two and five years ago. One of those crashes was a SAAB 340 that had a nose gear failure. With the exception of 11 airports (7%) who reported never having a crash, the balance of airports had a crash between 2 and over 20 years. Of these reported crashes, 120 were general aviation, and four were commuter.

Within the past five years 19 index A airports (13%) had crashes with fire on the airport. Of these 19, 14 were general aviation aircraft. Another 65 airports (44%) reported crashes with fire more than five years ago. The answer from 61 airports (41%) was never.

Research Question 5 - The expectation of ARFF service and the actual service at index A airports is not complimentary. The expectation created by the very name Aircraft Rescue Fire Fighting is not met by available resources dedicated to ARFF nor supported by regulation or standard. Pilots and possibly the public look to ARFF to fight fires, gain access to aircraft and rescue those onboard. ARFF as by regulation exists at index A airports to arrive at the scene of an aircraft incident and create a path of escape for the occupants for a period of one minute. Part 139 staffing requirements are not based upon the ability to effect rescue or fight fire, but to drive the required amount of apparatus to a specified location and discharge product. Evacuation of the aircraft is the responsibility of the flight crew.

DISCUSSION This research was unique to index A airports. While Airport ARFF conditions expressed by the American Association of Airport Executives to the FAA were dramatically different

from these findings, there were comments made regarding all Airport indexes. The Rural / Metro ARFF 1995 Survey did address index A airports but was directed towards an overall picture of airports. This study was focused on index A airport operational issues and incorporated the results of 155 out of a target population of 172 airports.

From this research, the ARFF profile of an average certificated index A airport dealing with unannounced crashes can be presented for review. In the past year the average airport had a 37% chance of having at least one crash, normally a General Aviation aircraft with a gear problem and a 3% chance of a crash with fire. An average minimum of 1.46 and maximum 2.56 non-military fire fighters responded to the site with 1062 gallons of water and 435 pounds of dry chem aboard the primary response unit. Arriving at the crash site, action was taken. Arriving at the airport seven minutes from the time of notification, additional fire fighting resources arrive.

The action to be taken cannot be stated as the diversity of staffing and ARFF units at each airport varies greatly. Staffing is critical in the ability of ARFF to perform rescue as economics is to airport operations. If you do not have enough, you cannot do much. In my opinion, one to two persons is not an aircraft rescue fire fighting force, but a first responder fire fighting effort. I also question the safety of one person units that require hand line deployment and use. Staffing levels for those on duty, whose primary job was ARFF, fluctuated very little. Staff on duty with ARFF as a secondary duty varied greatly with one airport reporting a minimum of one person and maximum of eleven. Several airports reported having more units than staff on duty to operate them.

From a statistical standpoint with emotions removed, there is no need for ARFF at index A airports. The United States Aviation Industry has an excellent safety record which continues to improve. When the broader scope of less than 30 seat carriers and general aviation is factored in, some

type of ARFF becomes reasonable. Add the psychological / emotional impact of ARFF as expressed by pilots and suspected, but not proven, by the public at large, and ARFF becomes a need.

Accepting that ARFF is a fixture at airports, the challenge is unequivocally defining the level of ARFF service to be provided. In attempting to provide ARFF in a cost conscious manner, the potential for ARFF to accomplish its mission has been diluted. In order for ARFF to be effective at index A airports, money, staff with ARFF as the primary duty and tailored programs, made to fit the individual needs and requirements of a specific airport in a specific region should be developed.

Based upon this research, the position the Lebanon Fire Department had taken was within industry accepted practices and the capabilities of the RIV currently in service.

RECOMMENDATIONS

To the NFPA - Develop a staffing requirement for index A airports and ARFF units that allows flexibility based upon local conditions. Establish the 1500 gallon, 450 / 500 pound ARFF unit as the minimum size unit for index A airports. Exclude the use of RIVs as a primary or singular response unit.

To the FAA - Develop and maintain ARFF response statistical data as presented here for future analysis and review. Establish the 1500 gallon, 450 / 500 pound ARFF unit as the minimum size unit for index A airports. Exclude the use of RIVs as a primary or singular response unit.

REFERENCES

3M Inc. (1981, February), Product Information, Light Water, AFFF/ATC, St. Paul Minnisota, 3M

Anderson, Don (1997, March 1) New Market Realities Sell Atlantic Coast on the RJ. Aviation International News 29, 63-64

Air Safety Committee (1997, March 4). Fatal events since 1970 for US Airways (formerly USAIR). Curtis, Todd Available: airsafe.com/events/airlines/usair.htm

Aircraft Safety, Table 10 FAA (1997) FAA Administrators Fact Book - Safety (1997, July 1) Source AFS-130,167-3433 Avilable: www.tc.faa.gov/ZDV/FAA/administrator/aircraft.html#10

Aviation Safety Web (1997, August 24) Available: www.pongnet.nl/avnsafety/410.htm

AVweb (1995, August 1). NTSB Accident Statistics for 1994. , AVweb Group Available: www.avweb.com/articles/ntsbstat.html

Bachtler, J.R.; Brennan, T.F. (Fifth Edition) The Fire Chief's Handbook, Fire Engineering Books, Pennwell Publishing Co.

Couta, M. Theresa; Marchi, Richard M. (1996, July 10) Position Letter to the FAA on ARFF Services. American Association of Airport Executives. Available: Airport Net www.airportnet.org/depts/regaff/rules/ac960711.htm

Aviation Safety, Table 5 (1997, July) FAA Administers Fact Book - safety, Available: www.ntsb.gov/aviation/table5.htm

Hoyt, H. Russel (1994, March) A Case Against ARFF Airport Business

International Fire Service Training Association (Third Edition) Aircraft Rescue and Firefighting, Fire Protection Publications, Oklahoma State University

Landings (1997, March 7). News by GA News & Flyer. Available: www1.drive.net/evird.acgi$pass*589...gs/ganflyer/mar7-1997/Accidents-Down.html

Liang II, Eric A (1996, November-December) Outsourcing ARFF. Airport Business 11, 15

NFPA Standard 403 (1993 Edition) Boston, NFPA

NFPA Standard 414 (1993 Edition) Boston, NFPA

NFPA Standard 1500 (1992 Edition) Boston, NFPA

NTSB Annual Review of Air Carrier Accident Data 1988-1992.

NTSB (1997, July 1). Commuter Air Carriers, Fatal Accidents, Fatalities 1993 National Transportation Safety Board table 9.7, Available: www.bts.gov/programs/oia/faasha/chap09/tab9-7.txt

NTSB (1996) U.S. Aviation, 1994 Preliminary Statistics. Available: www.ntsb.gov/Aviation/table1.htm

NTSB (1995, December 31). Source 382-8013 12/31/95, Comparison of U.S. Transportation Fatalities -Year 1994 vs. Year 1995. FAA Administrators Fact Book - Safety (1997, July) Available: www.tc.faa.gov/ZDV/FAA/administrator/safety.html#10

NTSB (1997 July1) Aircraft Accident Report, Runway Collision NTSB /ARR-97/04

Perkins, Captain Robert (1997, June 15), Available: The Airline Fire Page, www.niagara.com/~rperkins/firehome.htm

Phillips, Thomas J. (1994, May) Letter to the editor, Airport Business

Raeder, Jr. Phillip K. (1992, April) Firefighting Vehicles Airport Forum 2 46

Rhodes, Pat (1997, September)Victoria Regional Airport. Victoria Business Magazine (TX), Available: www.viptx/vbm/columns/997-vra.html

Rural / Metro Corporation, (1995) ARFF Survey, Rural / Metro Corporation, Scottsdale Arizona, Rural / Metro

Sussman, Ed (1988, November) Hey, Lou, This Propeller Looks Pretty Sturdy to Me. Washington Monthly 20, 32

Teele, W. B. (1992) NFPA 1500 Handbook, NFPA, Boston

Title 14 CFR Chapter 1 Federal Aviation Administration, DOT part 139.319, paragraph j, subsection 5

Westford Chemical Corporation (1995) BioSolve Specifications, Westford Massachusetts, BioSolve

APPENDIX A

Survey of Index A Airports

Individual Airport Data acquired by phone survey

Table 1 - Table 1 Identifies index A airports by state and then airport. Blank or partial phone numbers indicate those airports that did not respond within four attempts.

Table 2 -Table 2 identifies index A airports by Airport ID# and provides:

AVAILABLE - Minimum - Maximum personnel available for ARFF.

CLASSIFICATION - What is the affiliation of the ARFF staff

WATER - In gallons carried by the primary ARFF unit. There may well be other units and additional water on other units.

DRY CHEM - In pounds aboard the primary unit. A 500 pound unit normally had sodium bicarbonate as the chemical. A 450 pound unit normally had purple K.

Table 3 - Table 3 identifies index A airports by airport ID# and provides:

OPS/YR - Aircraft operations per year at the airport.

COM/OPS - Commercial air operations during the year, a portion of the OPS/YR

LAST CRASH OCCURRED - The last time a crash occurred, what caused the crash.

"GA" - General Aviation

"GEAR" - Some type of landing gear problem. In many cases, the craft landed gear up as the pilot forgot to put them down.

APPENDIX A, TABLE 1

AIRPORT MASTER

ID#	Airport	SERVICE	CONTACT	PHONE
ANB	Anniston Metropolitan	SCHED	PAUL HENTSCHEL	205-831-9738
MSL	Northwest Alabama Regional	SCHED	J LEHIRTER	205
FSM	Ft Smith Regional	SCHED	SGT HENSON	501-648-5100
FYV	Drake Field	SCHED	DALE WHITE	501-442-7771
TXK	TexArkana Regional-Webb Field	SCHED	PAULA NEESON	870-774-2171
FLG	Flagstaff Pulliam	NON	KEN PATRICK	520-556-1234
GCN	Grand Canyon National Park	SCHED	TERRY OLIFF	520-638-2446
IFP	Laughlin/Bullhead Intl	SCHED	DAVE SMITH	520-754-2134
ACV	Arcata	SCHED	FRAN FRITZ	707-839-5401
CCR	Buchanan Field	SCHED	HARRY WIGHT	415-646-5722
CIC	Chico Muni	NON	DAVE MAIN	916-895-4943
CRQ	McClellan-Palomar	SCHED	G MARCINKOWSKI	619-431-4646
MOD	Modesto City County- Harry Sham Field	NON	HOWARD COOK	209-577-5318
OXR	Oxnard	NON	TAD DOUGHERTY	805-382-3024
RDD	Redding Muni	SCHED	ROD INGER	916-224-4321
SBP	San Luis Obispo County - McChesney Fld	SCHED	JACKIE HULSEY	805-781-5205
SMX	Santa Maria Pub/Capt G Allan Hancock Fld	NON	GEORGE PERRY	805-922-1726
STS	Sonoma County	NON	DAVID ANDREW	707-524-7240
ALS	San Luis Valley Regional/Bergman Field	SCHED	MIKE HACKET	719-589-6444
CEZ	Cortez Muni	SCHED	RUSS MACHAN	970-565-7458
FNL	Ft Collins-Loveland Muni	NON	FRED ANDERTON	970-962-2852
RIL	Garfield County Regional	NON	PAUL HOFFMAN	970-625-1091
SBS	Steamboat Springs/Bob Adams Field	SCHED	WILLIAM ROGERS	970-879-9042
TEX	Telluride Regional	NON	RICH NUTALL	970-728-5313
BDR	Igor I Sikorsky Memorial	SCHED	KURT SENDLEIN	203-576-7201
GON	Groton-New London	SCHED	BILL PARKS	860-566-6661

APPENDIX A, TABLE 1

AIRPORT MASTER

ID#	Airport	SERVICE	CONTACT	PHONE
HVN	Tweed-New Haven	SCHED	SUE LEWIS	203-946-8284
		DE	ILG	New Castle County
APF	Naples Muni	SCHED	BOB LARSON	941-643-0733
EYW	Key West Intl	SCHED	JIM SMITH	352-473-0031
MTH	Marathon	SCHED	EDWARD SANDS	305-289-6060
VRB	Vero Beach Muni	NON	DALE JUSTICE	561-569-0019
ABY	Southwest Georgia Regional	SCHED	STEPHANIE COX	912-430-5175
AHN	Athens/Ben EPPS	SCHED	WYMAN TAYLOR	706-613-3420
BQK	Glynco Jetport	SCHED	GARY MOORE	912-265-2070
VLD	Valdosta Regional	SCHED	RICH CLARK	912-333-1833
ALO	Waterloo Muni	SCHED	GARY CUMMINS	319-291-4483
BRL	Burlington Regional	NON	MIKE SALAMONE	319-754-1414
DBQ	Dubuque Regional	SCHED	KEN KRAEMER	319-589-4136
FOD	Ft Dodge Regional	NON	RANDY HANNA	515-573-3881
MCW	Mason City Muni	SCHED	JEROME THIELE	515-421-3680
SUX	Sioux Gateway	SCHED	MIKE KLEIN	712-279-0170
IDA	Fanning Field	SCHED	JIM THORSEN	208-529-1221
LWS	Lewiston-Nez Perce County	SCHED	ROBIN TURNER	208-746-7962
PIH	Pocatello Regional	SCHED	LEN NELSON	208-234-6154
SUN	Friedman MeMorial	SCHED	RICH BAIRD	208-788-4956
ALN	St Louis Regional	NON	RANDY MILES	618-259-2531
BMI	Central IL Reg APT at Bloomington NorMal	SCHED	SCHNIEDER	309-663-7383
CMI	Univ of Illinois - Willard	SCHED	JOHN SMITH	217-244-8604
DEC	Decatur	NON	BILL WHITEMAN	217-428-8836
MTO	Coles County Memorial	NON	JERRY CARTER	217-234-7120
RFD	Greater Rockford	SCHED	RANDY PAUL	815-965-8639
SPI	Capital	SCHED	BOB O'BRIEN	217-788-1060

APPENDIX A, TABLE 1

AIRPORT MASTER

ID#	Airport	SERVICE	CONTACT	PHONE
HUF	Hulman Regional	NON	CHARLE GOODWIN	812-877-2524
LAF	Purdue University	SCHED	R STROUD	765-743-3442
MIE	Delaware County-Johnson Field	NON	TOM CONRAD	765-747-5690
DDC	Dodge City Regional	NON	MIKE KLEIN	316-225-8100
FOE	Forbes Field	NON	DAVE STREMMING	913-862-2362
GCK	Garden City Regional	NON	PAM CHIPLEY	316-276-1190
SLN	Salina Muni	NON	DON CANUBO	913-827-3914
OWB	Owensboro-Daviess County	SCHED	TIM ROBERTS	502-685-8440
PAH	Barkley Regional	SCHED	RICHARD ROOF	502-744-0521
ESF	Alexandria Esler Regional	SCHED	JERRY THIELS	318-445-4235
LCH	Lake Charles Regional	SCHED	JOHN JOHNSTON	318-477-6051
TVR	Vicksburg Tallulah Regional	NON	TOM GRANT	504-543-0445
ACK	Nantucket Memorial	SCHED	DAVE SYLVIA	508-325-5300
HYA	Barnstable Muni-Boardman/Polando Field	SCHED	ROY MANNING	508-775-2020
MVY	Marthas Vineyard	SCHED	W REYNOLDS	508-693-7022
SBY	Salisbury - Wicomico County Regional	SCHED	BOB BRYANT	410-548-4827
PQI	Northern Maine Regional Apt at Presque Is	SCHED	BILL CARON	207-7642538
BEH	Southwest Michigan Regional	SCHED	SHINDELDECKER	616-927-3194
CMX	Houghtoon County Memorial	SCHED	TOM RYDING	906-482-3970
DET	Detroit City	NON	CHARLES BRODIN	313-852-6402
ESC	Delta County	SCHED	RANDY GASCON	906-786-4902
MKG	Muskegon County	SCHED	CHUCK ATWOOD	616-798-4596
MQT	Marquette County	SCHED	H PAWLEY	906-475-9651
PLN	Pellston Regional Apt of Emmet County	SCHED	WILMA KEEBLER	616-539-8441
BJI	Bemidji-Beltrami County	SCHED	PHIL SHEALY	218-759-3560
BRD	Brainerd-Crow Wing Co Regional	SCHED	STEVE SIEVEK	218-825-2166

APPENDIX A, TABLE 1

AIRPORT MASTER

ID#	Airport	SERVICE	CONTACT	PHONE
HIB	Chisholm-Hibbing	SCHED	NORM DANIELSON	218-262-3451
INL	Falls Intl	SCHED	ALAN ANDERSON	218-283-4461
TVF	Thief River Falls Regional	SCHED	IRVINE SCHMITKE	218-681-7680
COU	Columbia Regional	NON	RON SIMPSON	573-442-9770
JLN	Joplin Regional	NON	STEVE STOCKAM	417-623-0262
GLH	Mid Delta Regional	SCHED	CLIFF NASH	601-334-3121
GTR	Golden Triangle Regional	SCHED	LUKE ATKINS	601-327-4422
MEI	Key Field	SCHED	TOM WILLIAMS	601-482-0364
PIB	Hattiesburg/Laurel Regional	SCHED	DAVE SENNE	601-545-3111
TUP	Tupelo Municipal C D Lemons	SCHED	R BLICKENSDERFER	601-841-6570
EWN	Craven County Regional	SCHED	MELVIN COOPER	919-638-8591
HKY	Hickory Regional	SCHED	LARRY SCANTLIN	704-323-7525
INT	Smith Reynolds	SCHED	CODY CLARK	910-727-8084
ISO	Kinston Regional Jetport at Stallings Fld	SCHED	DON HOWARD	919-522-2922
OAJ	Albert J Ellis	SCHED	MARY BROWN	910-324-1100
PGV	Pitt-Greenville	SCHED	MAT WITTY	919-758-4707
RWI	Rocky Mount-Wilson	SCHED	JIM BRANTLY	919-446-7057
SOP	Moore County	SCHED	BOBBY COX	910-692-3212
LEB	Lebanon Muni	SCHED	TIM EDWARDS	603-298-8878
TEB	Teterboro	NON	DAVE HAMMERLY	201-288-5707
FMN	Four Corners Regional	SCHED	DOUG BARRETT	505-599-1443
HOB	Lea County /Hobbs	NON	BILL GATCHELL	505-393-4943
EKO	Elko Muni-J C Harris Field	NON	LOREN LIPPARELLI	702
WMC	Winnemucca Muni	NON	RICK URRESTI	702-623-5091

APPENDIX A, TABLE 1

AIRPORT MASTER

ID#	Airport	SERVICE	CONTACT	PHONE
ART	Watertown Intl	NON	FRANK ABERNATHY	315-639-3809
JHW	Chautauqua County / Jamestown	NON	KEN BRENTLEY	315
JRB	Port Auth-Downtown-Manhattan / Wall St	NON	VINCE IGNIZIO	212-248-7240
MSV	Sullivan County Intl	NON	FRED BOSCH	914
OGS	Ogdensburg Intl	NON	STEVE BELGARD	315-393-4721
PLB	Clinton County	NON	RALPH HENSEL	518-565-4795
POU	Dutchess County	NON	ED ROSE	914-486-6000
SLK	Adirondeck Regional	NON	R ROSENBARKER	518-891-4600
BKL	Burke Lakefront	NON	MIKE BARTH	216-781-6411
CGF	Cuyahoga County	NON	DAN KOZAR	216-289-4111
OSU	Ohio State university	NON	LT BOWERS	614-292-5460
YNG	Youngstown-Warren Regional	SCHED	TOM NOLAN	330-539-4233
LAW	Lawton-Fort Sill Regional	SCHED	TYSON MORGAN	405-581-3292
LMT	Klamath Falls Intl	SCHED	BILL HANCOCK	541-883-5372
PDT	Eastern Oregon Regional at Pendleton	SCHED	PATTY JOHLKE	541-276-7754
SLE	McNary Field	NON	TOM LONG	503-588-6314
AOO	Altoona-Blair County	NON	KATHY NOEL	814-793-3872
BFD	Bradford Regional	NON	CRAIG BICKEL	814-368-5928
DUJ	Du-Bosi -0 Jefferson County	SCHED	BOB SHAFFER	814-328-5311
FKL	Venango Regional	NON	ALAN PENSKA	814-432-5333
JST	Johnstown -CaMbria County	NON	JOE MCKELVEY	814-536-0002
LBE	Westmoreland County	NON	GABE MONZO	412-539-8100
LNS	Lancaster	NON	GREG ENGROFF	717-569-1221
RDG	Reading Regional/Carl A Spaatz Field	SCHED	TERRY SROKA	610-372-4668
UNV	University Park	SCHED	BOB DANNAKER	814-865-5511
FLO	Florence Regional	SCHED	SAM TURBEVILLE	803-669-5001
HXD	Hilton Head	SCHED	TOM RAY	803-689-5400

APPENDIX A, TABLE 1

AIRPORT MASTER

ID#	Airport	SERVICE	CONTACT	PHONE
ABR	Aberdeen Regional	SCHED	D NEUHART	605-626-7068
ATY	Watertown Muni	SCHED	JERRY RILEY	605-886-4733
PIR	Pierre Regional	SCHED	ELDON LAFAVE	605-773-7447
RAP	Rapid City Regional	SCHED	BRAD HAGEN	605-394-4195
MKL	McKellar-Sipes Regional	SCHED	RODNEY HENDRIX	901-423-0995
ABI	Abilene Regional	SCHED	FALCIONI	915-676-6367
ACT	Waco Regional	SCHED	WALTER SCHRUB	817-750-8656
BPT	Jefferfson County	SCHED	FRED PURGHAN	409-722-9203
CLL	Easterwood Field	SCHED	MAT LOVELL	409-845-4811
GGG	Gregg County	SCHED	ROGER WALTERS	903-643-3031
ILE	Kileen Muni	SCHED	BUSTER SHAW	254-699-5585
SJT	Mathis Field	SCHED	A RYLANT	915-659-6409
TPL	Draughon-Miller Central TX Regional	NON	LEO HENRY	817-
TYR	Tyler Pounds Field	SCHED	DAVIS DICKSON	903-531-1277
CHO	Charlottesville - Albenarble	SCHED	BILL PAHUTA	804-973-8341
DAN	Danville Regional	NON	LEWIS	804-799-5228
LYH	Lynchburg Regional/Preston Glenn Field	SCHED	H ASHWELL	804-582-1153
PHF	Newport News /Williamsburg Intl	SCHED	TOM SMITH	757-877-0221
ALW	Walla Walla Regional	SCHED	LARRY ADAMS	509-529-0843
BFI	Boeing Field/King County Intl	NON	CINDY STEWART	206-296-7380
CLM	William R Fairchild Intl	SCHED	JEFF ROBB	360-457-1138
EAT	Pangborn Memorial	SCHED	ARNY CLARKE	509-884-2494
MWH	Grant County	NON	RON JENSON	509-762-5304
PAE	Snohomish County (Paine Field)	NON	ADMINISTRATION	425-353-2110
PUW	Pullman/Moscow Regional	SCHED	DAVE CROWNER	509-334-4555
PWT	Bremerton National	NON	JOE O'LEARY	360-674-2381
YKM	Yakima Air Terminal	SCHED	J KILPATRICK	509-575-6150
CWA	Central Wisconsin	SCHED	DAVE EDENS	715-693-2147
EAU	Chippewa Valley Regional	SCHED	JASON KNIGHT	715-839-4900

APPENDIX A, TABLE 1

AIRPORT MASTER

ID#	Airport	SERVICE	CONTACT	PHONE
OSH	WittMan Regional	NON	TERRY ABRAHAMS	920-424-0092
RHI	Rhinelander-Oneida County	SCHED	SHERRIE BRIGGS	715-365-3416
CKB	Benedum	NON	JIM GRIFFITH	304-842-3400
MGW	Morgantown Muni-Walter L. Bill Hart Field	NON	JIMMY LIDSOMB	304-291-7461
PKB	Wood Cty Apt Gill Robb Wilson Field	NON	PAUL HESCHT	304-464-5113
COD	Yellowstone Regional	SCHED	NANCY WERNER	307-587-5096
CYS	Cheyenne	SCHED	L DEMELLO	307-772-6338
GCC	Gillettte-Campbell County	SCHED	JAY LUNDELL	307-686-1042
LAR	Laramie Regional	SCHED	ANDY RYAN	307-742-4164
RIW	Riverton Regional	SCHED	JOE STREETER	307-856-4721
RKS	Rock Springs-Sweetwater County	SCHED	GARY VALENTINE	307-352-6880
SHR	Sheridan County	SCHED	NORM FECK	307-674-4222
WRL	Worland Muni	NON	JOE NEHL	307-347-8977

AIRPORTS: 172

APPENDIX A - TABLE 2

Airports - RESOURCES

ID#	AVAILABLE	CLASSIFICATION	WATER	DRY CHEM	FD RESPONSE
ABI	1-3	AIRPORT ARFF	1000	500	4MIN FD
ABR	1-2	STRUCTURAL FD	1500	500	8MIN FD
ABY	2-3	PUBLIC SAFETY	1500	500	2MIN FD
ACK	1-2	AIR OPS	1500	500	6MIN COMBI
ACT	3-5	STRUCTURAL FD	1500	500	14MIN FD
ACV	1-4	AIR OPS	1500	500	4MIN FD
AHN	1-2	AIR OPS	300	500	5MIN VFD
ALN	1-4	PUBLIC SAFETY	3000	0	4MIN FD
ALO					
ALS					
ALW	1-1	PORT AUTHORITY	1500	0	5MIN FD
ANB	1-1	STRUCTURAL FD	SKID	SKID	10MIN FD
AOO	1-2	AIR OPS	UNKNOWN	UNKNOWN	3MIN VFD
APF	2-2	STRUCTURAL FD	1500	500	6MIN FD
ART	1-3	AIR OPS	300	300	5MIN VFD
ATY	1-1	STRUCTURAL FD	1500	500	3MIN FD
BDR	1-2	AIR OPS	1500	500	4MIN FD
BEH	1-1	AIR OPS	750	500	6MIN VFD
BFD	1-3	AIR OPS	1500	500	10MIN VFD
BFI	2-5	PUBLIC SAFETY	1500	500	1MIN BOEING
BJI	1-1	AIR OPS	1500	500	8MIN COMBI
BKL	2-2	STRUCTURAL FD	1500	500	5MIN FD
BMI					
BPT	2-4	AIR OPS	1500	450	5MIN COMI
BQK	3-3	STRUCTURAL FD	500	500	5MIN FD
BRD	1-1	AIR OPS	1500	500	6MIN COMBI
BRL					
CCR					
CEZ					
CGF	1-2	AIR OPS	1000	450	15MIN VFD
CHO	2-6	PUBLIC SAFETY	1500	500	10MIN VFD
CIC	2-3	STRUCTURAL FD	1000	500	2MIN FD
CKB	1-3	AIR OPS	500	500	5MIN COMI
CLL	2-2	AIR OPS	1000	450	5MIN FD
CLM	1-1	AIR OPS	300	500	6MIN FD
CMI	1-3	AIRPORT ARFF	1500	0	6MIN VFD
CMX	1-5	AIR OPS	1500	500	10MIN VFD
COD	4-4	AIR OPS	1500	500	6MIN FD
COU	3-3	PUBLIC SAFETY	1500	500	5MIN VFD
CRQ	1-1	CONTRACT	200	450	6MIN FD
CWA	1-7	AIR OPS	1500	500	13MIN VFD
CYS	MILITARY	MILITARY	MILITARY	MILITARY	MILITARY
DAN	1-1	STRUCTURAL FD	1200	500	5MIN FD
DBQ	1-3	AIR OPS	1000	500	4MIN FD
DDC	1-1	STRUCTURAL FD	1000	500	10MIN FD
DEC	1-1	AIRPORT ARFF	SKID	SKID	3MIN FD
DET	INDEX B	INDEX B	INDEX B	INDEX B	INDEX B

APPENDIX A - TABLE 2

Airports - RESOURCES

ID#	AVAILABLE	CLASSIFICATION	WATER	DRY CHEM	FD RESPONSE
DUJ	1-5	AIR OPS	1000	500	20MIN VFD
EAT	1-1	STRUCTURAL VFD	1500	500	10MIN COMBI
EAU	1-1	AIRPORT ARFF	1000	500	3MIN COMBI
EKO					
ESC	1-2	AIR OPS	1500	500	8MIN FD
ESF	NO CERT	NO CERTIFICATE	NO CERT	NO CERT	NO CERT
EWN	2-2	PUBLIC SAFETY	SKID	SKID	7MIN VFD
EYW	MILITARY	MILITARY	MILITARY	MILITARY	MILITARY
FKL	1-3	AIR OPS	500	500	5MIN VFD
FLG	2-3	AIR OPS	500	500	8MIN FD
FLO	1-2	AIRPORT ARFF	500	500	6MIN FD
FMN	1-1	STRUCTURAL FD	1500	350	3MIN FD
FNL	2-2	STRUCTURAL FD	500	500	7MIN FD
FOD	1-4	AIR OPS	400	150	7MIN FD
FOE	6-6	PUBLIC SAFETY	1500	500	8MIN COMBI
FSM	MILITARY	MILITARY	MILITARY	MILITARY	MILITARY
FYV	2-2	STRUCTURAL FD	1000	500	4MIN FD
GCC	1-3	AIR OPS	1200	500	8MIN COMBI
GCK	1-2	STRUCTURAL FD/AIR OPS	1500	500	15MIN FD
GCN	3-3	AIRPORT ARFF	1500	500	24MIN FD
GGG	1-2	PUBLIC SAFETY	1500	500	3MIN VFD
GLH	2-2	PUBLIC SAFETY	0	500	4MIN FD
GON	1-1	AIRPORT ARFF	175	500	5MIN FD
GTR	1-2	PUBLIC SAFETY	SKID	SKID	10MIN FD
HIB	1-3	AIR OPS	1000	300	5MIN FD
HKY	1-1	STRUCTURAL FD	600	450	3MIN FD
HOB	2-2	STRUCTURAL FD	1500	500	5MIN FD
HUF	MILITARY	MILITARY	MILITARY	MILITARY	MILITARY
HVN	1-1	STRUCTURAL FD	1500	500	4MIN FD
HXD	2-2	AIRPORT ARFF	200	HALON	4MIN FD
HYA	2-2	AIR OPS	1500	500	3MIN FD
IDA	1-1	STRUCTURAL FD	1500	500	5MIN FD
IFP	2-3	AIR OPS	1500	500	5MIN FD
ILE	2-2	STRUCTURAL FD	500	500	5MIN FD
ILG	MILITARY	MILITARY	MILITARY	MILITARY	MILITARY
INL	1-5	AIR OPS	1500	500	8MIN VFD
INT	1-3	AIRPORT ARFF	600	500	3MIN FD
ISO	2-5	AIR OPS	1500	0	3MIN FD
JHW					
JLN					
JRB	0-0	STRUCTURAL FD	FIXED SYS	0	4MIN FD
JST	5-5	AIR OPS	1500	500	2MIN COMBI
LAF	1-2	AIR OPS	300	500	4MIN FD
LAR	1-2	AIR OPS	1000	500	15MIN FD
LAW	2-2	STRUCTURAL FD	1500	500	4MIN FD
LBE	1-3	AIR OPS	1500	450	4MIN COMBI

APPENDIX A - TABLE 2

Airports - RESOURCES

ID#	AVAILABLE	CLASSIFICATION	WATER	DRY CHEM	FD RESPONSE
LCH					
LEB	1-1	STRUCTURAL FD	300	500	7MIN FD
LMT	MILITARY	MILITARY	MILITARY	MILITARY	MILITARY
LNS	1-6	AIR OPS	1000	500	5MIN VFD
LWS					
LYH	1-1	STRUCTURAL FD	1500	500	7MIN FD
MCW	1-3	AIR OPS	200	500	10MIN FD
MEI	MILITARY	MILITARY	MILITARY	MILITARY	MILITARY
MGW	2-3	AIR OPS	300	500	7MIN FD
MIE	2-4	OFF DUTY FIRE FIGHTERS	500	500	4MIN FD
MKG	1-2	STRUCTURAL FD	1500	500	6MIN FD
MKL	1-1	AIRPORT ARFF	300	500	8MIN FD
MOD	3-3	STRUCTURAL FD	1500	500	8MIN FD
MQT	1-2	AIR OPS	1500	500	5MIN VFD
MSL					
MSV					
MTH	1-1	STRUCTURAL VFD	1500	500	5MIN VFD
MTO	1-3	AIR OPS	150	500	7MIN FD
MVY	3-3	AIR OPS	1500	500	18MIN VFD
MWH	2-4	AIR OPS	1500	500	4MIN VFD
OAJ	1-2	AIR OPS	1500	500	10MIN VFD
OGS	1-2	AIR OPS	600	500	3MIN FD
OSH					
OSU	1-1	STRUCTURAL FD	500	500	4MIN FD
OWB	1-1	STRUCTURAL FD	200	500	3MIN VFD
OXR	1-1	AIR OPS	1000	500	2MIN FD
PAE	2-3	STRUCTURAL FD	3000	500	2MIN BOEING
PAH	1-2	PUBLIC SAFETY	1800	0	10MIN VFD
PDT	1-1	AIR OPS	1000	500	5MIN FD
PGV	2-2	AIR OPS	1680	0	3MIN FD
PHF	1-4	PUBLIC SAFETY	1500	500	18MIN FD
PIB	1-1	AIRPORT ARFF	125	350	12MIN FD
PIH	1-1	STRUCTURAL FD	1500	500	10MIN FD
PIR	1-1	STRUCTURAL VFD	1500	500	6MIN VFD
PKB	2-6	AIR OPS	1000	500	6MIN COMBI
PLB	2-2	AIR OPS	1000	500	5MIN VFD
PLN	1-1	CONTRACT	500	500	10MIN VFD
POU	1-7	AIR OPS	1500	750	7MIN COMBI
PQI	0-0	STRUCTURAL COMBI	300	500	4MIN FD
PUW	1-5	AIR OPS	1500	500	5MIN FD
PWT	2-4	AIR OPS	250	350	5MIN FD
RAP	2-2	STRUCTURAL FD	1500	500	10MIN FD
RDD	2-2	STRUCTURAL FD	SKID	SKID	9MIN FD
RDG	1-9	AIR OPS	300	500	13MIN VFD
RFD	2-5	PUBLIC SAFETY	3000	HALON	3MIN FD
RHI	1-1	AIR OPS	1500	500	9MIN FD

APPENDIX A - TABLE 2

Airports - RESOURCES

ID#	AVAILABLE	CLASSIFICATION	WATER	DRY CHEM	FD RESPONSE
RIL	1-2	AIR OPS	SKID	SKID	15MIN VFD
RIW	1-3	AIR OPS	500	500	8MIN COMBI
RKS	1-2	AIR OPS	1500	500	20MIN VFD
RWI	1-1	PUBLIC SAFETY	600	450	8MIN VFD
SBP	1-1	STATE FORESTRY	1500	500	4MIN FD
SBS	2-4	AIR OPS	500	500	4MIN VFD
SBY	3-3	AIRLINE	1500	500	13MIN COMBI
SHR	2-2	STRUCTURAL FD	1500	500	5MIN FD
SJT	1-3	STRUCTURAL FD	1000	500	7MIN FD
SLE	0-0	STRUCTURAL FD	1500	450	2MIN FD
SLK	1-5	AIR OPS	SKID	SKID	20MIN VFD
SLN					
SMX	2-2	STRUCTURAL FD	1500	500	9MIN FD
SOP	1-2	AIR OPS	500	500	5MIN VFD
SPI	3-3	PUBLIC SAFETY	1500	0	3MIN NTL GRD
STS	1-2	AIR OPS	1500	500	5MIN COMI
SUN	1-3	AIR OPS	1000	450	4MIN VFD
SUX	MILITARY	MILITARY	MILITARY	MILITARY	MILITARY
TEB	1-11	AIR OPS	1500	500	10MIN VFD
TEX	1-2	AIR OPS	SKID	SKID	18MIN VFD
TPL					
TUP	1-1	PUBLIC SAFETY	1500	450	4MIN FD
TVF	1-2	AIR OPS	1000	400	4MIN COMBI
TVR					
TXK	1-1	STRUCTURAL FD	500	100	5MIN FD
TYR	1-2	STRUCTURAL FD	1500	500	13MIN FD
UNV	1-2	AIR OPS	1000	500	18MIN VFD
VLD	2-2	STRUCTURAL FD	1000	500	8MIN COMBI
VRB	1-1	STRUCTURAL FD	300	500	6MIN FD
WMC	NO CERT	NO CERTIFICATE	NO CERT	NO CERT	NO CERT
WRL	1-2	AIR OPS	300	500	4MIN COMBI
YKM	1-1	STRUCTURAL FD	100	500	5MIN FD
YNG	MILITARY	MILITARY	MILITARY	MILITARY	MILITARY

COUNT OF 'ID#': 172

APPENDIX A- TABLE 3

AIRPORT - ACTIVITY

OPS/YR	COM/OPS	LAST CRASH OCCURRED	CRASH WITH FIRE	NTSB INCIDENT
90882	16000	15-20YRS	25+ YRS	
39818	16296	2-5YRS, GA	NEVER	
23483	9015	5-10YRS, GA	OVER 5 YRS	
122879	81917	1-2YRS, GA	5-10 YRS, GA	
62885	10924	2-5YRS, GA	OVER 5 YRS	
87500	12500	0-1YR, GA GEAR	25+ YRS	
52420	3744	0-1YR, GA GEAR	10-15 YRS	
88011	1311	0-1YR, GA	1-2 YRS, MILITARY	
56899	18914			
29734	6084			
66793	7940	2-5YRS, GA GEAR	NEVER	
31500	4300	2-5YRS, GA GEAR	NEVER	
35866	8850	UNKNOWN	UNKNOWN	
151646	62550	5-10YRS, GA	NEVER	
44500	1700	0-1YR, GA GEAR	10-15 YRS	
16400	5800	5-10YRS, GA	NEVER	
104300	4369	0-1YR, GA	2-5 YRS, GA	34451
38142	2600	1-2YRS, GA	15-20 YRS	
18548	3548	1-2YRS, GA GEAR	NEVER	35102
354231	54394	2-5YRS, GA	UNKNOWN	
32694	7064	0-1YR, GA	NEVER	
73921	14098	2-5YRS, GA	10-15 YRS	
78146	14512			
50573	17105	1-2YRS, GA	15-20 YRS	
22190	3890	5-10YRS, GA GEAR	OVER 5 YRS	
36160	5080	2-5YRS, GA	NEVER	
23600	8500			
280547	5774			
14860	3510			
67306	2179	0-1YR, GA GEAR	25+ YRS	
64634	20634	0-1YR, GA GEAR	NEVER	
63351	13278	2-5YRS, GA GEAR	2-5 YRS, DC4	
60652	5983	2-5YRS, GA	20-25 YRS	
69224	8932	0-1YR, GA	10-15 YRS	

APPENDIX A - TABLE 3

AIRPORT - ACTIVITY

OPS/YR	COM/OPS	LAST CRASH OCCURRED	CRASH WITH FIRE	NTSB INCIDENT
75400	11650	2-5YRS, GA	UNKNOWN	
181334	22280	0-1YR, GA	25+ YRS	
16580	6240	0-1YR, GA	5-10 YRS, GA	
36435	7275	1-2YRS, GA	UNKNOWN	
37245	16186	5-10YRS, GA	OVER 5 YRS	
204200	16032	NEVER	NEVER	33595
42998	18927	0-1YR, GA GEAR	NEVER	
30425	200	2-5YRS, GA	0-1YR, GA	
36748	30700	0-1YR, GA	NEVER	
30501	2301	1-2YRS, GA GEAR	NEVER	
52059	9438	5-10YRS, GA	NEVER	
101612	11178			
13200	6201	2-5YRS, GA GEAR	NEVER	
116808	5324	1-2YRS, GA	15-20 YRS	34908
51843	8736	0-1YR, GA	1-2 YRS, GA	
19000	8800		34520	
59812	13944	2-5YRS, GA GEAR	NEVER	
14422	5560	NO CERT	NO CERT	NO CERT
61978	15966	0-1YR, GA	OVER 5 YRS	
20026	3772	1-2YRS, GA GEAR	2-5 YRS, GA	
69250	8750	0-1YR, GA	2-5 YRS, GA	
36299	10710	0-1YR, GA GEAR	NEVER	
102410	19047	0-1YR, GA GEAR	15-20 YRS	34683
87940	7740	2-5YRS, GA	NEVER	
23200	5500	5-10YRS, GA	NEVER	
31845	2215	2-5YRS, GA	NEVER	
44840	26574	20-25YRS	20-25 YRS	
33960	10418	2-5YRS, GA	NEVER	34414
158911	12628	1-2YRS, GA GEAR	NEVER	
201674	193676	0-1YR, GA	1-2 YRS, GA	8/8/91, 2/28/96, 6/29/96
72144	6014	0-1YR, GA GEAR	10-15 YRS	
35434	2865	10-15YRS	15-20 YRS	
65122	6585	2-5YRS, GA	15-20 YRS	
27800	18300	NEVER	NEVER	

APPENDIX A - TABLE 3

AIRPORT - ACTIVITY

OPS/YR	COM/OPS	LAST CRASH OCCURRED	CRASH WITH FIRE	NTSB INCIDENT
21681	8534	2-5YRS, SAAB 340 GEAR	NEVER	33971
45660	12300	2-5YRS, GA	2-5 YRS, GA	34682
37824	20064	2-5YRS, GA GEAR	10-15 YRS	
68589	1244	NEVER	NEVER	
83616	18192	0-1YR, GA GEAR	NEVER	
175476	139847	10-15YRS, GA GEAR	NEVER	
45865	12820	1-2YRS, GA	NEVER	
53502	18077	0-1YR, GA	NEVER	
42500	12800	5-10YRS, AIR SHOW	NEVER	
43360	8260	5-10YRS, GA	NEVER	
70259	3562	0-1YR, GA GEAR	15-20 YRS	
34545	5472	2-5YRS, GA GEAR	5-10 YRS, GA	
42226	5280			
48145	39660			
16936	0	NEVER	NEVER	
39996	10796	NEVER	15-20 YRS	
127356	6407	0-1YR, GA		
14000	3500	5-10YRS, GA	UNKNOWN	
41699	14344	2-5YRS, GA	OVER 5 YRS	
68748	6705	0-1YR, COMMUTER DEER	NEVER	
43552	16031			
52466	11753	2-5YRS, GA GEAR	NEVER	
128764	10553	1-2YRS, GA GEAR	OVER 5 YRS	
67557	37358			
50563	14207	0-1YR, GA GEAR	2-5 YRS, GA	
38200	25900	10-15YRS, AIR CARGO	NEVER	
36547	8492	0-1YR, GA	10-15 YRS	
39729	1335	1-2YRS, GA	NEVER	
81863	32694	10-15YRS	10-15 YRS	
32996	3751	10-15YRS	10-15 YRS	
91781	16340	1-2YRS, GA	5-10 YRS, GA	
29302	10777	5-10YRS, GA	NEVER	
37350	1350			
26698	321			

APPENDIX A - TABLE 3

AIRPORT - ACTIVITY

OPS/YR	COM/OPS	LAST CRASH OCCURRED	CRASH WITH FIRE	NTSB INCIDENT
59074	7218	1-2YRS, HELO	NEVER	
50000	32500	2-5YRS, GA GEAR	NEVER	
55301	22592	0-1YR, GA GEAR	UNKNOWN	
126229	5263	1-2YRS, GA	25+ YRS	
45440	15440	2-5YRS, GA GEAR	NEVER	
1830	630	NEVER	NEVER	
96909	2893			
136089	1273	2-5YRS, GA GEAR	5-10 YRS, GA	
53437	2901	1-2YRS, GA GEAR	10-15 YRS	
110415	22047	0-1YR, GA GEAR	10-15 YRS	
176052	6744	1-2YRS, GA	5-10 YRS, GA	
46158	14439	1-2YRS, GA	5-10 YRS, GA	
26124	23840	0-1YR, GA GEAR	NEVER	
49500	16500	0-1YR, GA	NEVER	
161513	22934	0-1YR, GA GEAR	2-5 YRS, GA	
93050	5050	5-10YRS, GA	NEVER	
53445	10121	0-1YR, GA GEAR	NEVER	
29470	4365	2-5YRS, GA	15-20 YRS	
50147	8562	0-1YR, GA	10-15 YRS	
26150	10150	1-2YRS, GA GEAR	NEVER	
13500	6500	2-5YRS, GA	15-20 YRS	
140684	4558	0-1YR, GA	15-20 YRS	
12874	10024	2-5YRS, GA GEAR	15-20 YRS	
143714	28857	2-5YRS, GA GEAR	OVER 5 YRS	
98215	1000	0-1YR, GA GEAR	0-1YR, SKY DIVERS	
65451	65451	5-10YRS, GA	OVER 5 YRS	
112954	16088	1-2YRS, GA	5-10 YRS, AIR SHOW	
130643	19682	25+YRS	NEVER	
110985	21339	0-1YR, GA GEAR	15-20 YRS	34764
49940	13920	25+YRS	25+ YRS	
7494	2172	NEVER	NEVER	
15076	3696	10-15YRS	10-15 YRS	34967
15016	4467	0-1YR, GA	10-15 YRS	

APPENDIX A - TABLE 3

AIRPORT - ACTIVITY

OPS/YR	COM/OPS	LAST CRASH OCCURRED	CRASH WITH FIRE	NTSB INCIDENT
26200	4700	NEVER	NEVER	
110130	26548	5-10YRS, GA	OVER 5 YRS	
6102	100	25+YRS	NEVER	
150150	23500	0-1YR, GA GEAR	10-15 YRS	
27351	3851	0-1YR, GA GEAR	10-15 YRS	
71000	11788	0-1YR, GA	OVER 5 YRS	
60667	764	0-1YR, GA	NEVER	
44328	8928	0-1YR, C130	NEVER	
65741	28879			
63230	13836	1-2YRS, GA	NEVER	
32000	3850	NEVER	5-10 YRS, GA	
103675	46939	0-1YR, MILITARY GEAR	15-20 YRS	
156603	8484	15-20YRS	15-20 YRS	
84266	25391	1-2YRS, GA	15-20 YRS	
209667	32562	1-2YRS, GA GEAR	2-5 YRS, HELICOPTER	
14957	2061	0-1YR, GA	NEVER	
43457	2032			
63937	9491	NEVER	NEVER	
36600	1500	2-5YRS, GA	2-5 YRS, GA	
3000	0			
43927	12594	1-2YRS, GA	10-15 YRS	
81292	15073	0-1YR, GA GEAR	NEVER	
53140	20010	0-1YR, GA GEAR	15-20 YRS	
49028	2868	10-15YRS	15-20 YRS	
224748	1583	0-1YR, GA GEAR	2-5 YRS, GA	
24520	16370	NO CERT	NO CERT	NO CERT
6502	2751	0-1YR, GA	NEVER	
72868	18316	0-1YR, GA	OVER 5 YRS	

OF 'ID#': 163

APPENDIX B

Index A Airport Survey

A list of United States certified airports was obtained from Mr. Kenneth Gilliam, Senior Fire Safety Specialist for the Federal Aviation Administration. From this list, 230 airports were identified as certificated index A airports. Of this number, 39 airports were military bases and 19 were outside the contiguous United States. The survey was conducted for the remaining 172 airports. At the completion of the survey, 155 responses had been obtained.

While conducting the survey, it was discovered that two previously indexed airports had let their certification expire and one had increased its level to index B. Data was not collected from these airports. Nine other public index A airports have military crash rescue contingents that provided ARFF services for the airport. Data obtained from these nine airports is included in Tables 2, 5 and 6 of this Appendix. These tables have a possible 152 responses. Tables 1, 3, and 4 exclude airports covered by the military and are based upon a possible 143 responses.

Airport Telephone Survey Instrument

(1) How many personnel are available, minimum and maximum for ARFF duties at your airport? The replies to this question are tabulated in Table 1.

(2) How would you classify those performing ARFF services; airport maintenance or operations, dedicated ARFF, structural fire department, contract personnel, other? The replies to this question are tabulated in Table 2.

(3) How much water and dry chemical is carried on your first responding unit? The replies to this question are tabulated in Table 3.

(4) How long does it take, in minutes, for mutual aid or additional help to arrive? The replies to

this question are tabulated in Table 4.

. (5) When was the last unannounced incident at your airport? The replies to this question are tabulated in Table 5.

(6) When was the last unannounced crash with fire at your airport? The replies to this question are tabulated in Table 6.

APPENDIX B, TABLE 1 How many personnel are available, minimum and maximum for ARFF duties at your airport?

Personnel	ARFF as Primary Job		Multi-Task		Misc	
0	1 2	COMBI FIRE DEPT. FIRE DEPT.				
1	5 2 16 3	ARFF CONTRACT FIRE DEPT. VOL. FIRE DEPT.	7 2	AIRPORT OPS PUBLIC SAFETY	1 1	PORT AUTHORITY STATE FORESTRY
1-2	1 3	ARFF FIRE DEPT.	19 3	AIRPORT OPS PUBLIC SAFETY	1	FIRE DEPT/AIR OPS
1-3	3 1	ARFF FIRE DEPT.	12	AIRPORT OPS		
1-4			2 2	AIRPORT OPS PUBLIC SAFETY		
1-5			5	AIRPORT OPS		
1-6			1	AIRPORT OPS		
1-7			2	AIRPORT OPS		
1-9			1	AIRPORT OPS		
1-11			1	AIRPORT OPS		
2	1 12	ARFF FIRE DEPT.	4 2	AIRPORT OPS PUBLIC SAFETY		
2-3	2	FIRE DEPT.	3 1	AIRPORT OPS PUBLIC SAFETY		
2-4	1	OFF DUTY FF'S	4	AIRPORT OPS		
2-5			1 2	AIRPORT OPS PUBLIC SAFETY		
2-6			1 1	AIRPORT OPS PUBLIC SAFETY		
3	1 2	ARFF FIRE DEPT.	1 1 2	AIRLINE MAINT.. AIRPORT OPS PUBLIC SAFETY		
3-5	1	FIRE DEPT.				
4			1	AIRPORT OPS		
5			1	AIRPORT OPS		
6			1	PUBLIC SAFETY		
Totals	57		83		3	**Grand Total 143**

APPENDIX B, TABLE 2

How would you classify those performing ARFF services?

Number of Airports	Affiliation of Personnel Providing ARFF Coverage
1	Career firefighter with an airport operations person
1	Combination career / volunteer department provides fire fighters
1	Utilizes Port Authority personnel
1	Utilizes the State Forestry personnel
11	Airport ARFF Department with dedicated staff.
16	Airport Public Safety Department providing police, fire, EMS services
3	Contracted out ARFF coverage to other than municipal fire departments
3	Volunteer firefighters, paid for ARFF duty
40	Career fire fighters
66	Airport operations / maintenance personnel
9	Utilize on airport military ARFF resources
152	TOTAL

APPENDIX B, TABLE 3

How much water and dry chemical is carried on your first responding unit?

Total Number of Units	Amount of Water Carried	Number of Units	Amount of Dry Chemical Carried
1	Fixed Foam System	0	
8	Skid Units	8	Skid Unit
1	None	1	500
9	Less than 300 gallons	1 2 1 5	200 350 450 500
11	300	1 10	300 500
1	400	1	150
14	500	1 13	100 500
2 2 1	600 600 750	2 2 1	450 500 500
21	1000	1 1 3 16	300 400 450 500
2	1200	2	500
64	1500	1 1 4 58	0 350 450 500
2	less than 2000	2	0
3	3000	1 1 1	0 HALON 500
142	**TOTAL** (one airport did not provide this information)		

APPENDIX B, TABLE 4

How long does it take, in minutes, for mutual aid or additional help to arrive?

Response time	Career Fire Department			Miscellaneous
1 minute				1 Boeing Ind.
2 minutes	4		1	1 Boeing Ind
3 minutes	10	3	1	1 Military
4 minutes	17	3	3	
5 minutes	17	9	3	
6 minutes	7	3	3	
7 minutes	7	1	1	
8 minutes	5	2	5	
9 minutes	3			
10 minutes	6	7	1	
12 minutes	1			
13 minutes	1	2	1	
14 minutes	1			
15 minutes	2	2		
> 15 minutes	2	6		
Totals	83	38	19	3
Grand Total	143			

APPENDIX B, TABLE 5

When was the last unannounced incident at your airport?

Time since last unannounced incident / crash	General Aviation			
0-1 Years	23	26	1 Animal Strike	2 Military
1-2 Years	15	10	1 Gear	1 Helicopter
2-5 Years	18	12	1 SAAB 340, Gear	
5-10 Years	12	1		2 Air Shows
10-15 Years		1	1 Air Cargo	5 Unknown Type
15-20 Years	2			
Over 20 Years				4 Unknown Type
Total	**70**	**50**	**4**	**14**
Reported Never	11			
Grand Total	**149** (3 airports did not provide this information)			

APPENDIX B, TABLE 6

When was the last unannounced crash with fire at your airport?

Time since last unannounced crash with fire	General Aviation			
0-1 Year	2			1 Sky Diver plane
1-2 Years	2		1	
2-5 Years	10		1	1 Helicopter 1 DC-4
More Than 5 Years		12		
5-10 Years	8			1 Air Show
10-15 Years		18		
15-20 Years		18		
Over 20 Years		8		
TOTAL	22	56	2	4
Reported as Never	61			
Did not know	4			
Grand Total	149 (3 Airports did not provide this information)			

APPENDIX C

COMMUTER CRASHES ON AIRPORT 1991-1996

Tabulated from a list of individual aircraft reports

provided by Ms. Carol Floyd, NTSB

Table 1 - Table 1 documents the commuter aircraft crashes recorded by NTSB from 1991- 1996 at all airports. The Table is sorted by airport index.

Notes: "*****" means outside the contiguous United States or a military airport.

"******"is an entry where the fatalities were noted already in another entry

"Reg#" is the registry number of the aircraft

Table 2 -Table 2 identifies, by airport, the type aircraft involved in the crash and the company owning it.

Notes: Type is whether the aircraft was a **N**on scheduled or **S**cheduled service

Table 3 - Table 3 identifies, by airport and crash date, what the aircraft was doing when the crash occurred, what type of crash was it and what was the cause.

Notes: "**ATC**" is the Air Traffic Controller

APPENDIX C, TABLE 1Crashes from NTSB - 1991-1996

Airport ID	Index	Date	Reg #	Fatal
DLG	*A	5/8/95	N3588Z	0
ENA	*A	3/30/91	N308SC	0
GST	*A	6/24/95	N84468	0
BET	*B	7/13/92	N20086	1
BET	*B	11/12/94	N6322D	0
OME	*B	2/20/93	N4182G	0
OME	*B	12/18/95	N340K	0
OTZ	*B	10/15/94	N20752	0
SCC	*B	3/26/95	N4059H	0
YAK	*B	8/29/92	N3347L	0
GSN (SAIPAN)	*D	10/27/92	N5074J	3
ANC	*E	2/24/92	N723CA	0
08AK	*NONE	1/6/92	N91361	0
10AK	*NONE	8/8/92	N216CS	0
15Z	*NONE	7/18/94	N6CC	0
16A	*NONE	12/5/96	N54272	0
9Z4	*NONE	11/5/95	N7430N	0
A8L	*NONE	5/3/96	N670PA	0
AET	*NONE	10/19/91	N299GL	0
AET	*NONE	5/7/94	N8908N	0
AK08	*NONE	10/6/92	N76RL	0
AK45	*NONE	2/4/92	N76RL	0
AK47	*NONE	12/25/91	N27827	0
AK61	*NONE	8/3/96	N417OR	0
AK85	*NONE	2/8/94	N6470H	0
AKI	*NONE	1/20/95	N4480X	0
AQH	*NONE	6/18/92	N23CF	0
EAA	*NONE	9/19/91	N4894A	0
EEK	*NONE	5/3/91	N4593T	0
GAM	*NONE	6/29/93	N4112D	0
KEB	*NONE	1/8/92	N5282U	0
KEB	*NONE	12/10/95	N15175	0
KEK	*NONE	11/11/92	N9237M	0
KVL	*NONE	5/25/93	N401NA	0
KVL	*NONE	6/12/93	N222JA	0
KWP	*NONE	2/1/95	N1095F	0
MRI	*NONE	6/10/92	N7392U	0
MTM	*NONE	2/4/92	N13GA	0
ORI	*NONE	12/12/93	N43257	0
SCM	*NONE	10/18/91	N7353Q	0

APPENDIX C, TABLE 1Crashes from NTSB - 1991-1996

Airport ID	Index	Date	Reg #	Fatal
SCM	*NONE	12/4/92	N8374T	0
SLQ	*NONE	3/24/92	N84547	0
STOYAHUK, AK	*NONE	8/9/94	N756NG	0
TKA	*NONE	6/17/92	N125KT	0
TUSAYAN	*NONE	8/7/93	N444CR	0
TUSAYAN **	*NONE	8/7/93	N38903	0
VAK	*NONE	10/26/91	N724CA	0
VAK	*NONE	3/29/95	N756TA	0
VAN CURLERS BAR	*NONE	7/6/96	N700WA	0
WLK	*NONE	12/10/95	N5293X	0
WMO	*NONE	8/24/91	N228A	0
WNA	*NONE	12/3/93	N38393	0
Z03	*NONE	2/27/93	N8257A	0
Z09	*NONE	4/12/93	N13147	0
Z09	*NONE	5/1/93	N6332D	0
Z13	*NONE	11/18/94	N9829M	0
Z53	*NONE	8/31/94	N9825F	0
Z74	*NONE	11/8/93	N185FK	0
INDEX TOTAL	**58**	**INDEX FATAL**		**4**
ADQ	A	7/31/95	N17481	0
BDR	A	4/27/94	N990RA	8
BFD	A	2/7/96	N159YN	0
CRQ	A	12/23/91	N44PA	0
EAT	A	7/28/95	N51816	0
EKO	A	7/5/94	N310BD	0
FHU	A	12/30/94	N91090	0
FMN	A	12/15/94	N39ZV	0
GCC	A	3/21/94	N9415S	0
GCN	A	8/8/91	N161TA	0
GCN	A	2/28/96	N27989	0
GCN	A	6/29/96	N13GM	0
HIB	A	1/2/93	N342PX	0
HKY	A	12/14/94	N7628R	0
LNY	A	2/14/92	N33AP	0
RFD	A	3/6/95	N6622N	0
RIW	A	9/25/95	N10DF	0
INDEX TOTAL	**17**	**INDEX FATAL**		**8**

APPENDIX C, TABLE 1Crashes from NTSB - 1991-1996

Airport ID	Index	Date	Reg #	Fatal
BET	B	12/4/96	N20024	0
DAL	B	7/28/95	N31DB	0
HLN	B	8/20/94	N14MV	0
HRL	B	8/28/94	N966JW	0
JAC	B	7/2/96	N27518	0
MBS	B	3/5/92	N69662	3
MSO	B	12/1/91	N26932	0
OTZ	B	4/2/92	N9909Z	0
PFN	B	3/3/93	N90339	1
INDEX TOTAL	**9**	**NDEX FATAL**		**4**
ABQ	C	7/19/91	N96H	0
ACY	C	7/13/94	N69PS	0
BIL	C	11/21/92	N139PA	0
BIL	C	12/29/92	N2783Q	0
BIL	C	2/6/94	N2718Y	0
BOI	C	4/7/95	N25BH	0
BOI**	C	4/7/95	N3408Q	0
BUR	C	3/21/91	N711RY	0
CLE	C	6/1/92	N225SC	0
CLE	C	11/22/92	N893WA	0
CMH	C	7/1/91	N458J	0
CMH	C	7/11/95	N1723E	0
GRR	C	3/14/95	N930DP	0
GSP	C	9/27/95	N4095A	1
HOU	C	4/27/92	N14ORD	0
LEX	C	4/17/92	N27465	0
MCI	C	3/14/94	N90CA	0
MCI	C	12/8/94	N5647D	1
MEM	C	1/27/94	N3844C	0
MEM	C	12/15/94	N24320	0
MEM **	C	12/15/94	N927FE	0
RNO	C	9/6/94	N1081Q	1
SYR	C	11/8/91	N3063W	0
INDEX TOTAL	**23**	**INDEX FATAL**		**3**
CVG	D	3/25/95	N34010	0
DEN	D	11/29/91	N354AC	0
DEN	D	11/15/92	N317BH	0
DEN	D	5/2/96	N154ZV	0

APPENDIX C, TABLE 1Crashes from NTSB - 1991-1996

Airport ID	Index	Date	Reg #	Fatal
FLL	D	11/1/94	N5715C	0
LAS	D	7/12/93	N818AN	3
MCO	D	6/24/94	N495UE	0
MCO	D	6/23/96	N168CA	0
PHX	D	2/21/94	N4109D	0
PHX	D	3/12/94	N78CH	0
PHX	D	10/15/96	N15VZ	0
RSW	D	1/3/93	N18YV	0
STL	D	3/6/91	N401RW	0
STL	D	8/12/91	N339TE	0
STL	D	8/28/93	N2623C	0
INDEX TOTAL	**15**	**INDEX FATAL**		**3**
BOS	E	6/25/92	N2691W	0
DFW	E	7/27/91	N405AE	0
DFW	E	10/20/92	N404AE	0
DFW	E	10/1/93	N9762B	0
EWR	E	11/5/93	N550TD	1
IAD	E	4/23/96	N776FE	0
LAX	E	2/1/91	N6883AV	34
LAX	E	7/17/95	N268UE	0
MSP	E	2/15/95	N62711	0
MSP	E	3/5/95	N130UE	0
INDEX TOTAL	**10**	**INDEX FATAL**		**35**
AID	L	1/31/94	N9072	0
BKW	L	1/30/91	N167PC	0
BKW	L	3/17/93	N159PC	0
GRI	L	2/14/95	N4092C	0
HUT	L	7/29/91	N120EL	0
IXD	L	1/27/94	N1215M	0
MCK	L	11/23/92	N777CM	0
MNM	L	12/27/96	N337PL	0
STP	L	11/22/91	N35H	0
YIP	L	6/8/93	N51FG	1
YIP	L	1/24/96	N4108S	0
INDEX TOTAL	**11**	**INDEX FATAL**		**1**
019	NONE	7/24/96	N48DH	0
4PH	NONE	7/29/94	N985RA	0
81B	NONE	8/14/92	N14WW	0

APPENDIX C, TABLE 1Crashes from NTSB - 1991-1996

Airport ID	Index	Date	Reg #	Fatal
8G1	NONE	6/3/96	N86AT	0
8S2	NONE	2/16/96	N52264	0
APA	NONE	5/18/91	N44623	0
ARV	NONE	1/26/93	N37224	0
ASG	NONE	4/2/95	N512E	0
AUG	NONE	10/6/91	N120FA	0
AUO	NONE	2/8/96	N2201F	0
COLUMBIA, TN	NONE	7/2/91	N500FM	0
DPA	NONE	12/4/91	N38RM	0
FEP	NONE	7/11/95	N67100	0
FHR	NONE	3/22/93	N8768Q	0
GAI	NONE	8/9/96	N1439T	0
HITE, UT	NONE	8/17/94	N2732K	0
HNM	NONE	10/11/95	N9205F	0
HVR	NONE	2/8/94	N5520A	0
IOW	NONE	12/3/91	N14TP	0
L17	NONE	7/19/94	N414RH	1
LNR	NONE	9/21/93	N9825Q	0
M15	NONE	3/20/95	N163GA	0
MFI	NONE	3/20/96	N1835E	0
MLS	NONE	1/4/96	N924WS	0
MRB	NONE	8/3/94	N4875U	1
N47	NONE	8/14/96	N163SA	0
OA3	NONE	1/18/96	N4457X	0
OH30	NONE	1/17/92	N9042X	0
OIL RIG	NONE	7/26/92	N2072B	1
OPF	NONE	6/22/95	N530JB	0
OQ5	NONE	7/4/92	N929DB	0
ORL	NONE	9/21/92	N2013S	0
ORL	NONE	9/21/92	N777BK	0
ORL	NONE	11/15/93	N91WW	0
OWD	NONE	2/21/94	N777JM	0
OXC	NONE	5/1/91	N445BL	0
PBF	NONE	4/29/93	N24706	0
PNE	NONE	8/18/92	N66LA	0
Q88	NONE	4/11/96	N9820Y	0
RBD	NONE	2/21/96	N4825J	0
RIE	NONE	11/27/92	N7989Q	0
RZT	NONE	9/28/96	N618BB	0
SJU	NONE	10/7/93	N781T	0
SPG	NONE	11/14/91	N2015W	1

APPENDIX C, TABLE 1Crashes from NTSB - 1991-1996

Airport ID	Index	Date	Reg #	Fatal
SPG	NONE	2/3/94	N72074	0
TNT	NONE	5/11/93	N9985V	0
U30	NONE	1/13/92	N22592	2
WA24	NONE	5/25/94	N6782L	0
WALDRON, WA	NONE	7/3/91	N737BZ	0
INDEX TOTAL	**49**	**INDEX FATAL**		**6**
REPORT TOTAL	**192**	**TOTAL FATAL**		**64**

APPENDIX B, TABLE 2

INDEX A ON AIRPORT CRASHES

ID	Date	Aircraft	Type	DBA
	7/31/95	GRUMMAN G-44 AMPHIB	N	PENAIR
	4/27/94	PIPER PA-31-350	N	ACTION AIR CHARTERS
	2/7/96	BEECH 1900D	S	USAIR EXPRESS
	12/23/91	LEAR 25B	N	FLIGHT MANAGEMENT INC
	7/28/95	CESSNA 402B	N	AEROFLIGHT EXECUTIVE SER
	7/5/94	CESSNA 310J	N	COPPER STATE AIR SERVICE
	12/30/94	CESSNA 207	N	COURIER SERVICES INC
	12/15/94	BEECH 1900D	S	UNITED EXPRESS
	3/21/94	BEECH 95-C55	N	NORTHERN CO AIR CHARTER
	8/8/91	CESSNA 402C	N	SIERRA NEVAD AIRWAYS
	2/28/96	PIPER PA-31-350	N	LAS VEGAS AIRLINES
	6/29/96	CESSNA 402A	N	AIR VEGAS
	1/2/93	SAAB 340A	S	NORTHWEST AIRLINK
	12/14/94	CESSNA 402B	N	GRAND STRAND AVIATION
	2/14/92	BEECH D-18H	N	POLYNESIAN AIRWAYS
	3/6/95	CESSNA T210N	N	PROMPT AIR
	9/25/95	CESSNA 340	N	AMERICAN CHECK TRANSPORT

Γ OF Airport ID: **17**

APPENDIX C, TABLE 3

INDEX A CRASH DETAILS

Date	Operation	Incident	Cause	Fatal	Serious	Minor	Nor
7/31/95	TAKEOFF	GROUND LOOP	MECHANICAL	0	0	0	2
4/27/94	LANDING	HIT BLAST FENCE	PILOT / VIS	8	1	0	0
2/7/96	LANDING	OVER RUN	PILOT / ICE / GUSTS	0	0	2	14
12/23/91	LANDING	OVER RUN	PILOT	0	0	0	3
7/28/95	TAKEOFF	EMERGENCY LANDING	MECHANICAL	0	0	0	1
7/5/94	LANDING	GEAR FAILURE	MECHANICAL	0	0	0	1
12/30/94	LANDING	OVER RUN	ATC/CONSTRUC/WIND	0	0	0	1
12/15/94	TAKEOFF	BAGGAGE DOOR OPEN	GROUND PERSONNEL	0	0	0	15
3/21/94	EMER LNDG	GEAR UP LANDING	MECHANICAL	0	0	0	3
8/8/91	TAKEOFF	ANIMAL STRIKE	ANIMAL STRIKE	0	0	0	10
2/28/96	LANDING	GEAR FAILURE	ICE/PILOT	0	0	0	10
6/29/96	LANDING	UNDERSHOOT	WIND	0	0	0	10
1/2/93	LANDING	GEAR FAILURE	PILOT / ICE	0	0	0	31
12/14/94	LANDING	OVER RUN	PILOT / VISIBILITY	0	0	1	0
2/14/92	LANDING	GEAR FAILURE	WIND	0	0	0	1
3/6/95	EMER LNDG	GEAR FAILURE	MECHANICAL	0	0	0	1
9/25/95	TAXI	BRAKE FAILURE	MECHANICAL	0	0	0	2

Fatal: **8**
Serious: **1**
Minor: **3**
UNHURT: **105**